APRIL 22, 1937 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

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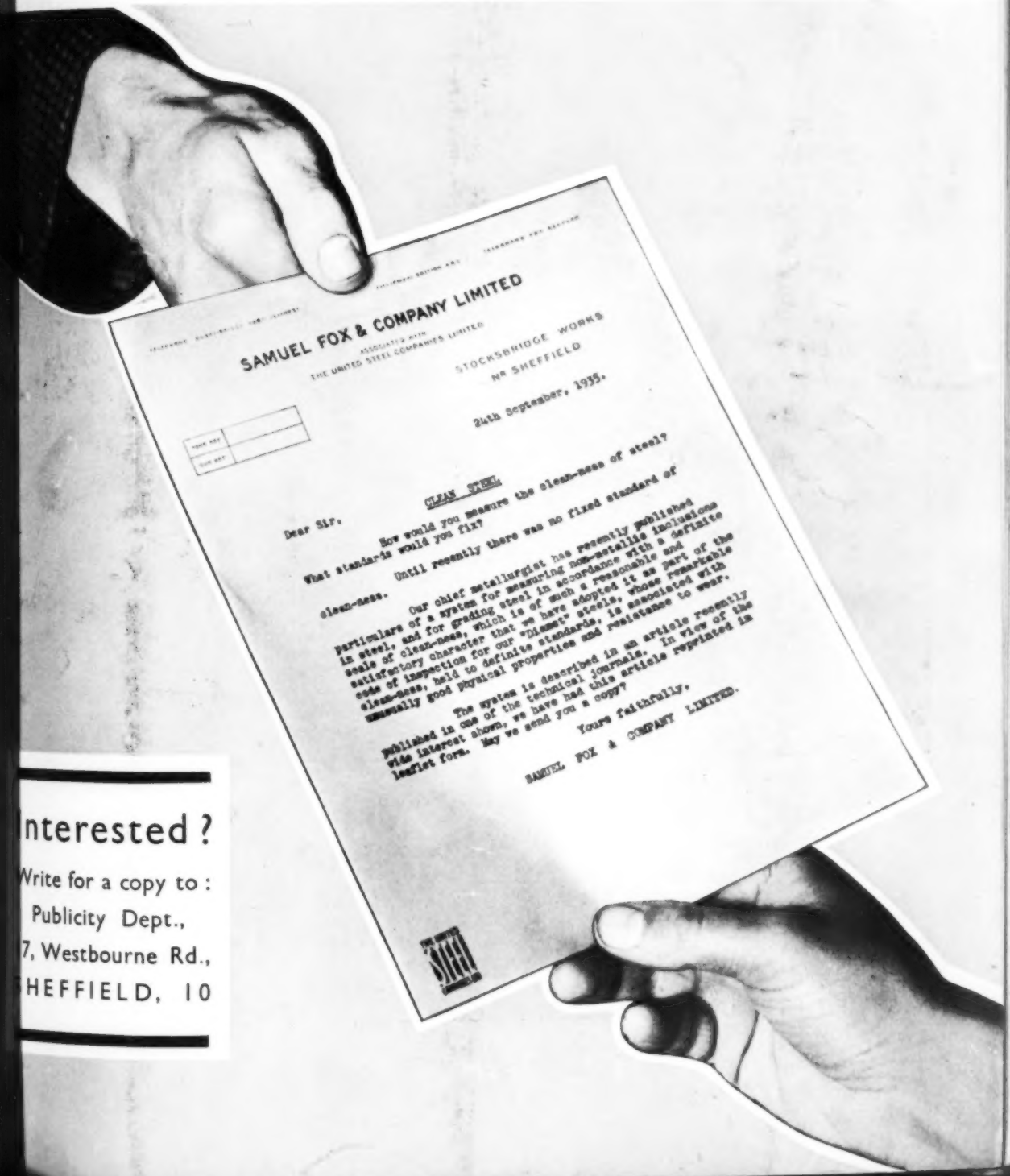
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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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Achilles' Heel

EVERY student of air defence ought to read with attention the article in this issue on the subject of air defence. The writer, Mr. MacLanachan, an ex-pilot of No. 40 Squadron during the War, draws attention, as *Flight* has frequently done, to the serious position created by the division of responsibility in air defence between the Air Ministry and the War Office.

Air defence is rather like a rowing eight. Every member of the crew must be just one cog in a perfect machine. The time must be kept impeccably, and the whole crew must put into practice the principles taught by the coach. At present air defence is like a crew in which all the bow-side oars have been coached by one man and use swivel rowlocks, while all the stroke-side oars have been coached by another and use fixed rowlocks. Absolute timing and absolute unanimity of performance are no more important in rowing than they are in air defence. Now that the speed of bombers has risen to over 250 m.p.h. it will never do (to continue the rowing metaphor) for Seven to be a fraction of a second late on Stroke.

By night air defence depends absolutely on the perfect co-operation of fighter aircraft with the searchlights. Though we may fill the skies with hosts of Hurricanes and Spitfires, their wonderful performance will avail them nothing unless the searchlights can light up the enemy. The raider who escapes the beams will be left at liberty to work his wicked will at his own good pleasure. In fact, the whole scheme of air defence at night hinges on the efficiency of the searchlights, and if that is not first class, then our great cities will be in parlous case in time of war.

During the financial depression it was only in accordance with human nature for the War Office to pay first attention to its own problems of mechanisation, and to leave to the last the needs of the anti-aircraft units which it would not control in time of war. If the Air Ministry had controlled those units from the first there is no doubt that their equipment would have received quite as much care as was bestowed on the production of first-class aircraft. The succession of fighters, Snipe, Grebe, Gamecock, Siskin, Bulldog, Demon, Fury, to Hurricane and Spitfire is a record of which the Air Ministry may well be proud. The stagnation of the searchlights and the A.A. guns during the same years is the other side of the picture. Admittedly, under the stimulus of the recent fervour for rearmament, the War Office has taken steps to remedy the laxities of the past years; but so long as that Department remains responsible for the ground elements of air defence there is no guarantee that, when the present fervour has evaporated, the old disastrous policy may not prevail again. A reasonable chance of safety can only lie in making one authority responsible for all sides of this vital subject.

A Weighty Problem

THE power of aero engines continues to increase at a rate which is flattering to the engine manufacturer and welcomed by the aircraft designer as it helps to give him that extra bit of performance for which he is always looking. It is, however, as well to remember that before the higher power is really useful, it has to be converted into thrust, and in a very interesting article in this issue Captain F. S. Barnwell points out that by the time the output of aero engines has reached the 2,000 h.p. mark, the airscrew question will have become really important, and that if we ever get power units of 4,000 h.p., for example, the airscrew weight per h.p. will rise from the 0.28 pound per h.p. of the 1,000 h.p. airscrew to the somewhat alarming figure of 0.56 pounds per h.p. In other words, the specific weight will be doubled.

This calculation is, of course, based upon the assumption that geometrically similar airscrews will be used. Diameter cannot, for reasons of efficiency, be much cut down without seriously affecting take-off thrust horse power and cruising efficiency. What, then, is likely to be the solution? In the paper which he is reading at the Royal Aeronautical Society to-night, Mr. George Mead refers to the same question. He states that results

of intensive development work give promise of reducing the weight by approximately one-third, but does not explain how the reduction is to be effected. Captain Barnwell refers to the use of hollow blades. Past experience with welded steel blades has not been altogether encouraging, owing to troubles with cracking. Perhaps the compressed wooden blades now being developed may be found to be one solution; synthetic resin blades may be another.

But apart from the quite sufficiently disturbing question of airscrew weight, there is also that of airscrew diameter. As already mentioned, this cannot be greatly reduced without spoiling the efficiency, and closely linked with this problem of airscrew efficiency is that of noise. For instance, an airscrew to absorb 2,000 h.p. will, it is estimated, require a diameter of about 17ft. if it is to have good efficiency. If it is running at the speed now usual, i.e., about 1,200 r.p.m., the speed of the airscrew tips will be 1,068 feet per second, which is approaching quite closely to the speed of sound. That this may reduce efficiency is but one side of the question. It will certainly also increase airscrew noise, and in large commercial aircraft this may prove a serious objection, as Mr. Lipscomb pointed out during the discussion of Mr. Fedden's recent lecture on aero engines.

In view of these considerations it would be well to ponder very carefully whether all the effort now being turned in the direction of larger and still larger aero engine units is likely to take us far along the right road.

As the size of aircraft increases—and there is every indication that, in flying boat work at least, this tendency is insistent—the only alternative to really large power units seems to be a multiplicity of units. Mr. Fedden mentioned the possibility, evidently with a view to obtaining the views of aircraft designers, of six or even eight engines in line on the leading edge of a large monoplane. Mr. Lipscomb alone of our aircraft designers thought it worth while to give Mr. Fedden a pointer, and he expressed some disquiet at the idea of so many engines across the wing.

It may be that for the really large machine of the future we shall have to come to a combination of the tandem and in-line-abreast engine arrangements. Airscrew shafting is likely to add a good deal of weight, but so will the two-speed airscrew gear which appears to be unavoidable if we attempt to convert 2,000 or 3,000 h.p. into thrust with a single airscrew; and as aircraft increase in size, the problem of housing the smaller engine sizes inside the wing becomes a little easier, whereas the stepping-up of engine size to keep pace with aircraft size must tend to keep us where we are at present in the matter of projecting engines. The Dornier Do. X was premature in its engine arrangement, but a modification may succeed.

TIME FLIES: Even the hustlers and bustlers of New York paused recently to goggle at Capt. Frank Hawks' new monoplane, with which, sponsored by an American watch company, he hopes to make his "come-back" in the record-breaking game. The engine is a Pratt and Whitney Twin Wasp of over 1,000 h.p. The undercarriage is retractable—and so are both pilot and windscreen: after reaching his altitude Hawks lowers his seat, and the screen automatically closes flush with the fuselage.

The Outlook

A Running Commentary on Air Topics

Flood-grounded

TO those concerned with military aviation there is food for thought, and some cause for uneasiness, in the extent to which service aerodromes have been rendered unusable by excessive flooding during the past winter. Nor is the trouble confined to service aerodromes. Cases have occurred of the condition of aircraft constructors' aerodromes holding up the test-flying of new types.

At the present time such difficulties are merely irritating. They interfere with programmes, but do not seriously affect ultimate results. In times of emergency, however, the story might be very different, and it is somewhat disquieting to reflect that had it so happenend that we were at war instead of otherwise (one refrains from using the word peace) the flooding of aerodromes might have had quite serious consequences.

If an appreciable percentage of aerodromes is unfit for use in time of war, the rest will obviously have to be used all the more. That means a concentration at those which *are* usable, and the enemy will not be slow to discover this and to concentrate on them as targets. A few may be rendered useless by bomb craters placed along the line of longest take-off, and it is possible to envisage circumstances which could render all but a small percentage of aerodromes unusable.

Adequate drainage and specially prepared runways would stop the flooding nuisance, but not the risk of immobilisation through the bombing of aerodromes. In fact, runways would tend to increase that risk. What is the answer? In view of the targets presented by any large number of aircraft concentrated at any one aerodrome, the ultimate solution may possibly be found in a scattering of aircraft rather than a concentration of them, using some means of mechanically assisted take-off to get the machines out of fairly small fields.

Aries

READERS of John Buchan's *Greenmantle* series of war stories will remember how his South African pilot sacrificed himself in order to prevent a German aeroplane from reporting vital news of a British movement by ramming the enemy machine. Various authentic cases occurred in air fights of British and German pilots charging each other head on and colliding, but presumably most of them hoped that the other would give way first. The scientific ram as a means of destroying enemy aircraft has often been considered but has never been adopted as official tactics.

An article in the spring issue of *The Royal Air Force Quarterly* suggests that, with properly designed aircraft, ramming might become a regular and most effective way of destroying raiding bombers, while the parachute would give the British pilot a very excellent chance of escaping unharmed. The ramming machine would usually be lost, but that would be a small price to pay for the destruction of a bomber and the severe blow which such tactics would deal to the morale of all prospective raiders. Of course, they would have parachutes, too, but those who descended safely would all be made prisoners of war. The cost of the sacrificed rammer would seem indeed small when one reflects that the bomber might have blasted the Bank of England had it not been itself destroyed.

The tactics suggested are that the rammer should dive on the tail of the bomber, come up underneath and fly its airscrew into the empennage of the bomber. The rammer pilot would then work a lever which would let him drop, complete with chair and oxygen apparatus, through the bottom of his fuselage. His seat would be near the tail, and he would be protected by a cone of armour in front of the fuel tank. He would carry no guns whatever. It all sounds delightfully simple.

Stage Management

THE York and Leeming Club, for their International Rally on June 4, 5 and 6, intend to avoid the conventional aircraft demonstrations of the kind which became rather monotonous last season.

It is a commendable innovation. One admires the technique of most of the demonstrating pilots, but one cannot help wearying of the spectacle of the same people doing the same things in the same aeroplanes. To this the aircraft constructor or agent may reply: "Yes, of course, because you *Flight* people go to all the meetings." Our answer is: "So do most of the people sufficiently interested in flying to want to buy your aeroplane." Having seen it performing at one or two previous demonstrations, and probably at various aerodromes at the week-ends between, they know as much as they want to know.

So far as the public enclosure is concerned, it is an air circus maxim to "have something in the sky all the time." Nevertheless, does not the one-and-threepenny patron get as tired as we do of seeing the 32 h.p. X——, the 35 h.p. Y—— and the 40 h.p. Z—— going through their more or less identical repertoires?

The ideal programme would have a strictly limited number of demonstrations by aircraft of widely assorted size, appearance and flying characteristics, and they would be put on in an order that brought out the contrasts.

The one difficulty would be that of giving everybody a fair show during the season.

The Grid

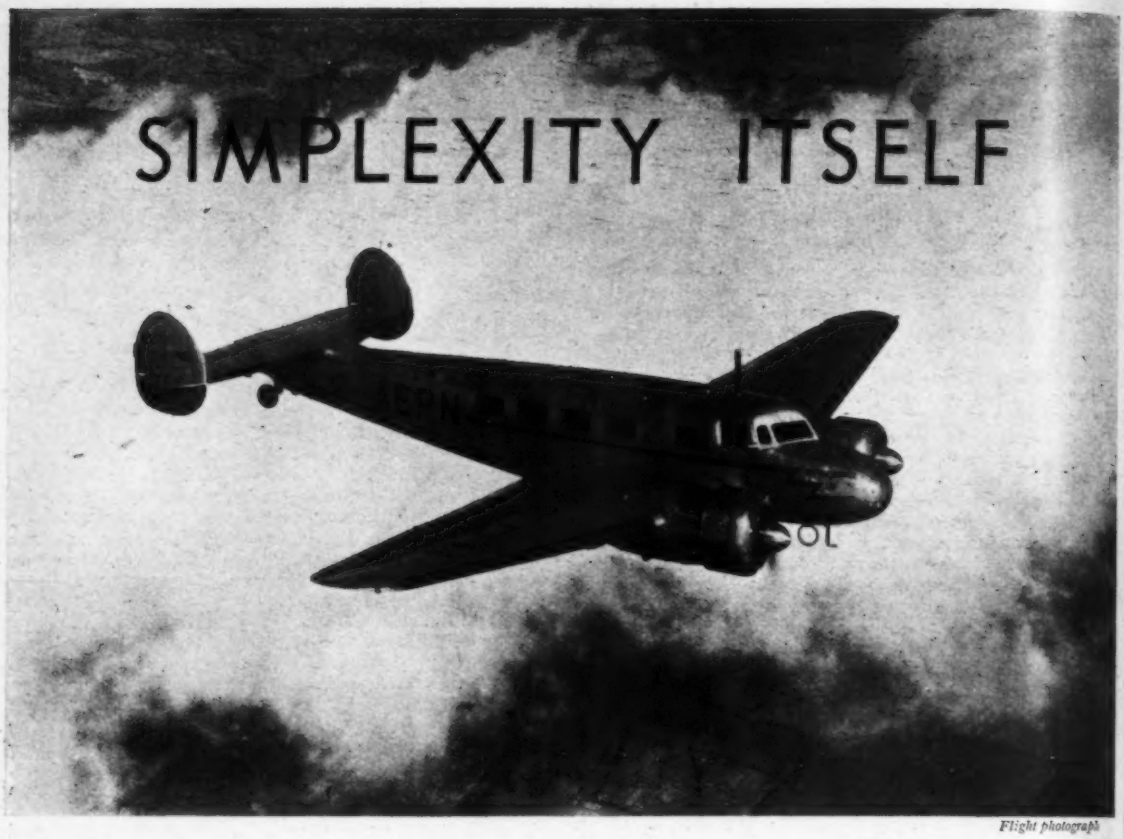
ONCE more a serious flying accident has drawn attention to the danger to aircraft which overhead high-tension electric cables constitute. It is, of course, perfectly true that the amount of flying done at the present time is not such as to warrant the very great expense which would be involved in placing these cables underground, an expense for which, in the end, the consumer would have to pay; but it is, more than ever, necessary to look ahead. Just as the present conditions on the roads might have been avoided if the development of road traffic could have been foreseen, so future generations may blame the present for failing to realise a development which will seem to them perfectly obvious.

In this connection it should be remembered that the danger of the electric grid is not confined to civil flying. When the R.A.F. expansion gets into full swing, the amount of flying done will be doubled and trebled, and it is not to be expected that the R.A.F. will escape fatalities arising from the grid danger when flying in bad visibility, as the Service must perforce do if its peace-time training is to be of any value.

One argument advanced by the electrical protagonists is, we believe, that pylons and cables are no higher than factory chimneys, church steeples, tall trees and other obstructions of which flying people have to beware. The theory does not seem particularly convincing, for power pylons, and more especially their cables, are gossamer-like by comparison, especially in bad visibility.

DIARY OF FORTHCOMING EVENTS—PAGE 386

SIMPLEXITY ITSELF



Flight photograph

Some Cockpit Impressions of the Lockheed Electra : Special Equipment for British Airways : Complexity Simplified

By H. A. TAYLOR

TWO general impressions are current at the present time in the matter of the modern transport aeroplane and the trend of its development. The first is that we are rapidly arriving at the stage when two pilots will have more on their hands than they can possibly cope with; the greater the operational efficiency to be demanded, the greater is the mass of equipment to be carried. The second is that high speeds leave a very small margin for possible error in such things as E.T.A. estimations with a low ceiling and in navigational calculations generally. Parenthetically, it is also suggested that the high-speed machine is a "handful"—requiring constant and undivided attention.

Such impressions, either mine or other people's, were at the back of my mind when British Airways provided the chance of making a reasonably extended flight in the control cabin of one of their new Lockheed Electras. Mr. Lynch-Blosse, the commodore of the company, was there to show me how everything worked, and Mr. Roode, who was getting his hand in with the new equipment, was there to show—incidentally, and without intention—how the experienced newcomer reacted to the new and extensive gadgetry to be found in these machines.

After a period of forty minutes in the second pilot's seat I felt that I could remember the whereabouts and purposes of all the controls, dials and indicators, and that any normally experienced transport pilot would be able to go through the various movements with subconscious ease after an hour or two of practice, leaving his thinking mind free to deal with the various D/F and D/R problems which are met in the ordinary course of all-weather transport flying. So much for the "complications."

Twenty minutes of personal experience and demonstration convinced me that this high-speed aeroplane was a good deal easier to fly and more fool-proof—as a flying machine—than the average light aeroplane. There are simply more things to look after. Once the Electra has settled down to cruise she flies by herself and will turn accurately on the ailerons alone. These are pleasantly light and smooth at all speeds—and they continue to work at or near the stall. Normal trimming requires only a turn or so of a handle mounted in the roof.

With the flaps down and the engines throttled back the glide is as steep as anyone could wish—so steep, in fact, that it is preferable to motor right down to the ground if the feelings of the passengers are to be spared. Furthermore, the normal approach is carried out at a speed very little in excess of an indicated 100 km./hr. (62 m.p.h.), and the machine is comfortably under control at speeds very much lower than this. The stall itself appears to be so innocuous that a slow approach is more than safe, it is normal.

All the operations necessary in preparation for the approach require the minimum of effort. Both the flap and undercarriage gear are electrically operated and each completes its work in a few seconds. The flaps can be left in any position at will, and, in addition to the warning lights on the dash, a hooter goes off in no uncertain manner if the engines are throttled back with the undercarriage still up.

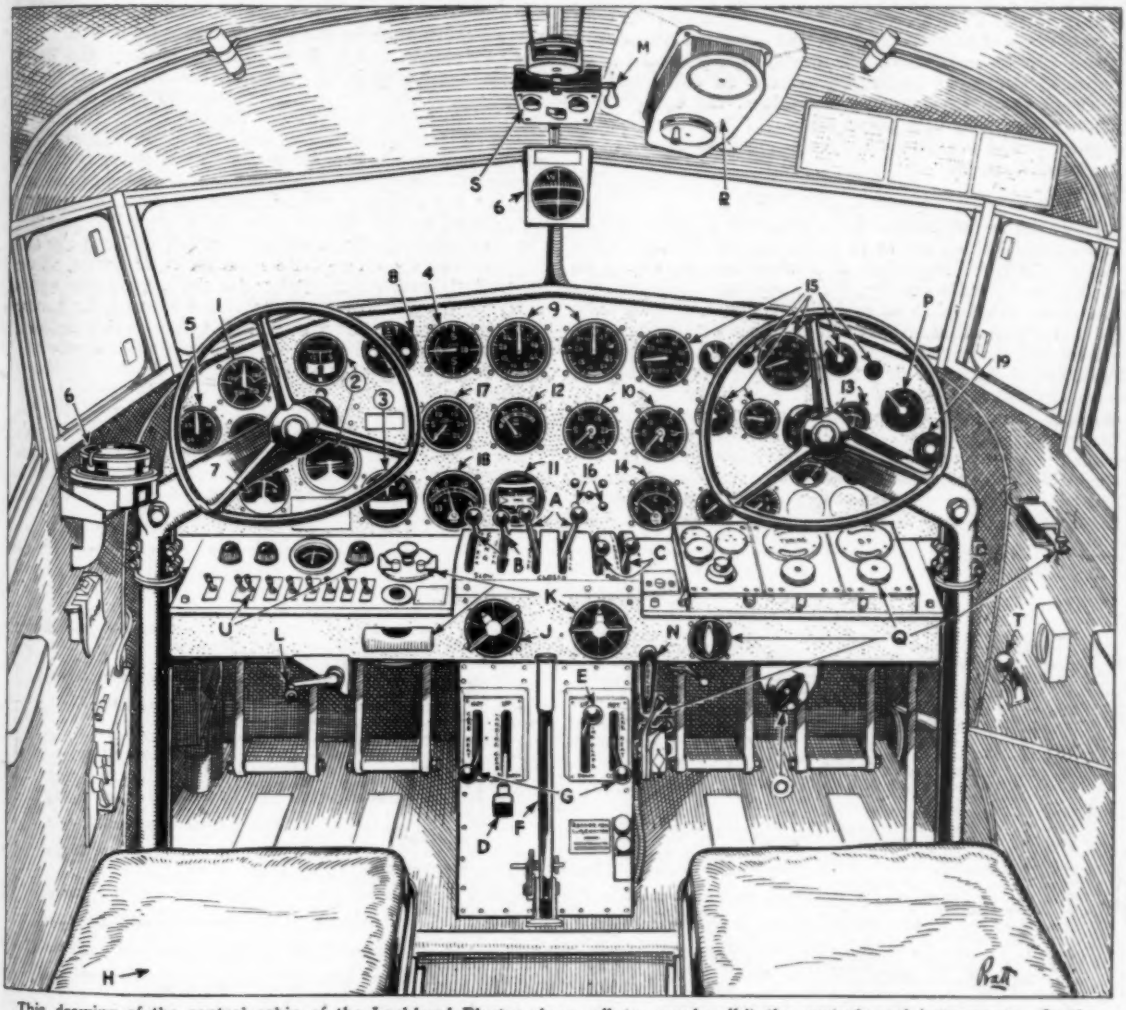
Leaving Southampton Airport in fairly poor visibility, we flew along the south coast in a gradual climb, until, by the time we had reached Brighton, we were at full operating height—a matter of 9,500 ft. Thence the machine was

put into a power glide towards Gatwick, which was reached at a height of 2,000 ft. or so. Consequently it was possible to make a study of engine-handling technique with constant-speed airscrews and so forth.

The throttle bank on the Electra carries, in addition to the two throttles, the c.s. airscrew governor regulators on the left and the mixture controls on the right. Below are gated levers for the carburettor heater controls, the undercarriage control (in bright scarlet) and the flap control. Very briefly, the engine revolutions are set by means of the pitch regulators, the manifold pressures are kept within reasonable limits by means of the throttles, and the mixture controls are moved in accordance with the readings shown on the Cambridge exhaust gas analyser. This, by registering the electrical resistance changes in a platinum wire stretched across the exhaust outlet, indicates the amount of carbon monoxide in the gases, and, consequently the efficiency of combustion—or the state of the mixture itself. In this country the Hobson automatic mixture control has been developed to save the pilot the trouble of regulating his mixture, and is being extensively used. In any case, however, a mixture indicator provides a useful guide for accurate setting when operations are being carried out at heights varying between zero and 15,000 ft.

For those who are not familiar with the operation of the Hamilton or D.H. constant-speed airscrew—which necessitates the use of such a control or indicator—it should be explained that, once the revolutions have been set by the pitch regulators, the airscrew governors automatically change the pitch within certain limits, keeping the revolutions constant. In other words, the c.s. airscrew permits an engine to operate quite automatically, and all the time, at its most efficient speed for different heights and conditions. A dangerously lean or expensively rich mixture will not therefore be shown by any falling-off in the indicated revolutions, such as is normally the case with c.p. or two-position v.p. airscrews. A slight loss of speed, or, more likely, of height, would provide the only indication of trouble, and by the time such a change had been noticed the pistons might be irrevocably damaged.

Only in the maximum "high" position of the regulators, when the airscrews are locked in coarse pitch for optimum



This drawing of the control cabin of the Lockheed Electra shows all (or nearly all!) the controls and instruments. In the interests of clarity the former have been distinguished from the latter by the use of letters instead of numbers.

(A) Throttles. (B) Airscrew governor controls. (C) Mixture controls. (D) Undercarriage control. (E) Flap control. (F) Brake lever. (G) Carburettor heater controls. (H) (beside seat) Emergency undercarriage control, fuel dump valves and master switch. (J) Fuel valves. (K) Ignition controls. (L) Directional trimmer. (M) Fore and aft trimmer. (N) Emergency fuel pump. (O) Engines primer. (P) Vacuum switch-over. (Q) Marconi remote panel and controls. (R) Marconi remote control for D/F loop. (S) Lorenz control panel. (T) Cabin temperature control. (U) General switchboard and de-icer regulator.

(1) Air-speed indicator. (2) Sperry horizon and gyro. (3) Turn indicator. (4) Rate-of-climb indicator. (5) Kollsman sensitive altimeter. (6) Compasses. (7) Marconi homing indicator. (8) Lorenz indicator. (9) Manifold pressure gauges. (10) Revolution counters. (11) Cambridge exhaust analyser. (12) Flap indicator. (13) Carburettor temperature gauges. (14) Cylinder head temperature gauge. (15) Fuel gauge dials and switches. (16) Undercarriage warning lights. (17) Vacuum indicator. (18) Air temperature gauge. (19) Passengers' signal light.

altitude cruising, will the revolution counters tell their tale of any impending woe. In this case, the counters and the analyser are used together to obtain the most economical setting of the throttles and mixture controls for any speed which it is necessary to maintain in order to fly to schedule on a regular service. At 2,000 r.p.m. and 9,600 ft. the Electra cruises at 195 m.p.h., and at this speed the engines are giving about 300 b.h.p. each. Incidentally, it is perhaps a good moment to remind those who look upon the Electra as an uneconomic proposition that it carries ten passengers, a crew of two and the usual baggage for 700 miles at this speed—and the maximum total horse-power is not excessive at 900

During the take-off the pitch regulators are, of course, placed fully forward in the fine-pitch position, the mixture levers are in the full-rich position and the throttles are opened just far enough to maintain the reading of the manifold pressure gauges below the danger sector—which starts at a figure equal to 90 cm. of mercury, or about +3 lb./sq. in. at ground level. Full throttle at ground level can be used for a few seconds in case of emergency.

Two other instruments and the appropriate controls must also be watched when operations are being carried out over a wide range of throttle positions and outside temperatures. These are the carburettor temperature gauges and heater controls. During a prolonged descent on small throttle openings, such as is normal nowadays, the carburettors might get so cold that either ice would be formed or the engines would not give their maximum power just when it was most needed.

Special Instruments

It would be impossible to describe all the instruments and controls which are to be found on the Electra, but a few of the more important and interesting ones may be dealt with. Needless to say, the navigational equipment is just about as complete as could be imagined. Apart from the radio equipment, which will be dealt with later, there are two compasses, one of the direct-reading bowl type and the other of the verge-ring type, Sperry horizon and gyro, a turn indicator, a Kollsman sensitive altimeter and a rate-of-climb indicator. Engine-driven vacuum pumps provide the power for the gyros, and the pitot head is electrically heated. A tray in front of the chief pilot carries all the essential electrical switches and fuses, and spares can be fitted in a moment when necessary. This tray also carries the Goodrich de-icer "volume" control, though the main control for this lies below the starboard seat. This de-icer works on the pneumatic pulsation principle, breaking away the accretions. Beside the first pilot's seat are the emergency hand control for the undercarriage, the fuel dump valves (in scarlet) and a master switch for the entire electrical equipment of the machine.

One of the most interesting features of the Electras, as they are being fitted out for British Airways, concerns the radio equipment, which consists of Marconi transmitters, receivers and D/F or homing equipment, and a Lorenz ultra-short-wave approach system installed by Standard Radio.

Radio Equipment

Each machine has a Marconi remote control panel placed on a tray in front of the second pilot, with a tapping key on his right, while the main equipment, with controls and key, is on the starboard side of the passenger cabin behind. The result is that any one of the fleet may be placed, without alteration and consequent delay, either on an easy daylight service where the second pilot's seat is taken by the radio operator, or on more difficult services when two pilots are carried in addition to a radio operator, who will then carry out his work in the passenger cabin.

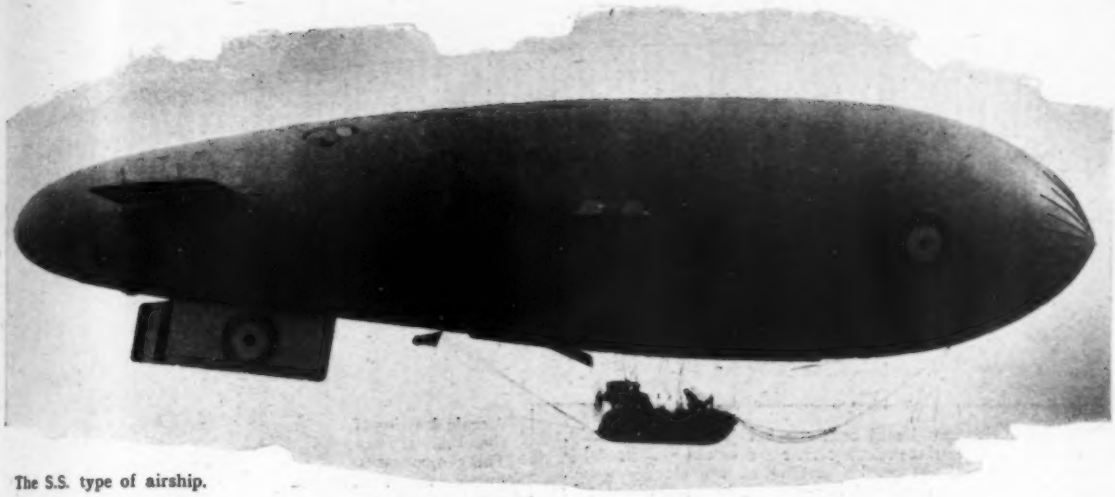
Furthermore, the D/F loop aerial receiver also has a remote control both for operation and tuning, so that it may be used either by the radio operator, wherever he may be placed, or by the pilots. The loop itself is mounted below the fuselage, and the control cabin panel is so placed in the roof that it may be reached from either seat. The bearing dial for this is coloured in red and green sectors so that the operator may, if required, read the bearings straight off to the pilot as so many degrees "to port" or "to starboard." For homing purposes the loop can also be fixed and the appropriate indicator is, of course, on the first pilot's dashboard. Power for the entire equipment is obtained from a rotary transformer driven by the battery—which certainly has a good deal to do on this machine; the "All-Electric Electra" would be a good name for it.

With such equipment the Electra should be almost entirely self-contained from the navigational point of view, and only routine messages need be transmitted when the air is congested. For some time it has been the practice on several Continental routes for the crew of the machines to obtain both bearings and fixes for themselves. Only so can the present radio troubles be satisfactorily solved and the air left free for messages of real urgency.

Forthcoming Events

April 22. R.Ae.S. Lecture* "Power Plant Trends," by Mr. J. G. Mead.
April 26. R.Ae.S. Presidential Address by Mr. H. E. Wimperis: "Flight as Related to the Laws of Nature," Institution of Electrical Engineers 8 p.m.
May 6. Aero Golfing Society: Instone Trophy.
May 9. R.Ae.S. Garden Party, Great West Aerodrome, Hayes.
May 12-19. Austrian Aero Club: Austrian Whitsun Flight.
May 13. Leicester Airport Coronation Air Display.
May 15. Cardiff Aero Club: Coronation Rally.
May 15-18. Yorkshire Gliding Club: Whitsun Meeting, Sutton Bank.
May 26—June 6. Brussels Aero Show.
May 26-30. Austrian Aero Club: Salzburg Gliding Contest.
May 27. R.Ae.S. Wilbur Wright Lecture: "Turbulence," by Dr. Theodor von Karman. Science Museum, South Kensington.
May 29. Empire Air Day.
May 29-31. London-Isle of Man Race and Round-the-Island Contests.
June 4-6. York and Leeming Club: International Meeting, York.
June 11-14. Hungarian Aero Club: International Conference.
June 12. Bristol and Wessex Aeroplane Club: Garden Party, Whitchurch.
June 15-20. Magyar Pilota Picnic, Hungary.
June 20. R.Ae.C. of Belgium: Gordon Bennett Balloon Race, Brussels.
June 21-28. Federation Aeronautique Internationale: London Conference.
June 26. Royal Air Force Display, Hendon.
June 28 and 29. S.B.A.C. Display, Hatfield.
July 1. Aero Golfing Society: *Flight* Trophy.
July 3. Newcastle-on-Tyne Aero Club: London-Newcastle Race.
July 3. Ramsgate Airport, Official Opening.
July 4-18. Aero Club of Germany: Wasserkuppe Gliding Meeting.
July 10. Cardiff Aeroplane Club: London-Cardiff Race.
July 11. Italian Aero Club: Circuit of Rome.
July 15. Aero Golfing Society: Jubilee Cup.
July 17. Portsmouth Aero Club: Garden Party.
July 23.-August 1. Swiss International Meeting.
July 24. Devon Air Day and Race: Plymouth and Exeter.
July 31. Cinque Ports Flying Club: Folkestone Aero Trophy Race.
July 31-August 2. Yorkshire Gliding Club: Opening Meeting, Sutton Bank.
August 1-14. Yorkshire Gliding Club: Instructional Camp, Sutton Bank.
August 1-31. New York-Paris Air Race Flights.
August 3-September 7. Public Schools Aviation Camp, Norwich.
August 6-7. Austrian Aero Club: International Rally, Lake Worth.
August 14-22. Yorkshire Gliding Club: Open Contest, Sutton Bank.
August 21. Thanet Aero Club: Aviation Meeting and Race.
August 21. Midland Aero Club: "At Home."
August 22-29. Italian Aero Club: Circuit of Littorio.
August 28 and 29. Cinque Ports Flying Club: Lympne International Rally and Wakefield Trophy Race.
September 10-11. R.Ae.C.: King's Cup Race.
September 12. Aero Club de France: Coupe Deutsch de la Meurthe, Etampes.
September 23. Aero Golfing Society: Cellon Trophy.

* These lectures take place in the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission is by ticket obtainable through a member.



The S.S. type of airship.

BLIMP REDIVIVUS?

The Small Non-rigid Airship Suggested as a Factor in Anti-Aircraft Defence

By W. O. MANNING, F.R.Ae.S.

OWING to the immense amount of interest being taken in new types of aeroplanes, and the high performances that are now being obtained, it seems to be forgotten that there is such a thing as a small dirigible balloon, and that it has certain attributes which are beyond the reach of an aeroplane. They are attributes which possess considerable importance for certain military operations.

It is, perhaps, necessary to say that I am not referring to rigid dirigibles, such as the Zeppelins which have such a magnificent record in commercial service in Atlantic crossings, but to the smaller non-rigid, say up to a capacity of 400,000 cu. ft. or so, of the type which did such useful service during the last war, and would be wanted to perform exactly the same sort of service in the next.

Small non-rigids have one and only one very serious disadvantage as compared with an aeroplane—their speed is incomparably lower. On the other hand they have the important advantage for certain purposes of being able to stand still in the air and of having a much larger duration of flight than has any practical aeroplane. For service in which a top speed of, say, 50 knots is good enough, and for which long duration at low speeds is important, they are necessarily superior to any aeroplane.

Let us recall what some of these services were. In the first case there was the escorting of convoys through submarine infested areas. It is stated, and, I believe, uncontradicted, that no dirigible-escorted convoy ever lost a ship. This was due to the comparative ease with which a submarine could be spotted from above, to the fact that the dirigible could reduce its speed to that of the submarine, and could at the same time fly low over the water; hence the bombs could be planted with accuracy. Further, wireless enabled a number of armed surface ships to be summoned and their depth charges generally settled the business, if it was not finished by the original bombing. The dirigible could remain over the convoy even if the latter was proceeding at a speed of some 8 to 10 knots, and might easily be able to stay in the air under these conditions for three days. For this sort of service the aeroplane must take a back seat.

It is not certain how many submarines were directly destroyed by dirigibles in the last war, but an approximate number seems to be about thirty. This figure does not include submarines destroyed by surface ships called up by the dirigibles, many of which submarines might have existed much longer had it not been for the keen eyesight of the aerial observers. The number thus destroyed is unknown, but is much larger than the number sunk by direct dirigible attack.

It is obvious that non-rigids cannot operate in an area infested by enemy aeroplanes, though they would have a much better chance if it was found possible to inflate them with helium instead of hydrogen. They would certainly be provided with a defensive armament of machine guns so that attacks could not be made with impunity. Normally their sphere of action would be those parts of the sea which are far enough away from the enemy country to make aeroplane attack unlikely, but which, for this reason, would be used extensively by our merchant shipping.

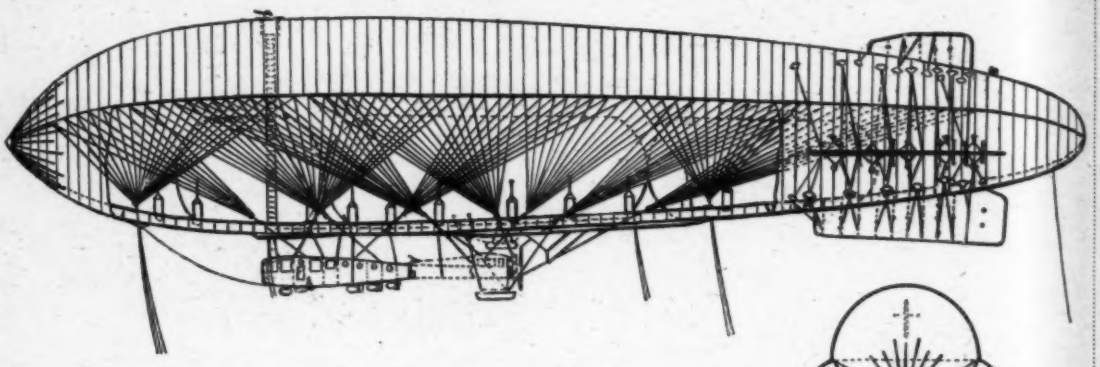
Although at least three days' duration could be attained by a modern dirigible of the type referred to it would not be necessary for the ship to return to her base at the end of this time. War experiments have shown that it is quite easy to refuel airships, and even to change their crews, at sea. The procedure is quite simple. The dirigible flies slowly over the refuelling ship and lets down a line which is seized by those on board. The airship is then hauled down to a convenient height, when fuel can be hauled up in tins and emptied into the tanks. The crew can be changed in a similar manner, by means of a bo'sun's chair. It might even be possible to arrange for gas replenishment if the surface ship was especially equipped for this purpose, though for refuelling almost any ship could be used provided she possessed the necessary stores.

Aerial Listening-posts

Apart from these uses, which were well tried out in the war, it would appear that non-rigid dirigibles might be of considerable use in the defence of a country against hostile air attack, especially at night. For this purpose the airship would be fitted with a listening apparatus similar to those used on land, and would be sent up above any clouds to some determined location, where she would stop her engines, drift and listen. This would have the important advantage of giving earlier warning of approaching aircraft than could be given by any other method, as the airship could operate well over the sea and as near to the enemy coast as was considered advisable. Drifting with the wind, and in constant wireless communication with the ground, she would have her position always, and information of the bearing and height of an approaching squadron, or even several bearings which might allow its approximate course and speed to be plotted would be invaluable to the defence, especially in view of the fact that the information would be available much sooner than it would be obtained by any other method. Minutes are of supreme importance in the matter of defence against hostile aircraft.

Further, as the airship would be drifting along, having its course constantly plotted by wireless observers on the ground, the direction and velocity of the wind at height could be found easily, and this information would be of the utmost value to the anti-aircraft gunners and others.

The question of risk to the crew deserves some consideration. Normally, I should expect the airship to operate above a cloud, into which she could easily descend in emergency.



A scale drawing of the N.S. airship. This 360,000 cu. ft. type measured 262ft. over all, carried a crew of eight, and had two 250-260 h. p. engines.

When inside she could still continue her job and, obviously, she would be safe, remembering that she would still be drifting and would, therefore, be moving at the cloud's speed. Even if a refuge of this kind is not available it is difficult to imagine that a hostile bombing squadron would detach a unit to attack her. Bombing aeroplanes would naturally carry the minimum amount of fuel considered necessary for the job in hand, so that the bomb load would be a maximum, and it is difficult to imagine one of them wasting fuel chasing dirigibles.

Apart from this, the airship would carry machine guns which would be operating from a very steady platform. She would naturally be coloured, possibly black, so as to be as inconspicuous as possible, and if she was inflated with helium she would not be at all easy to bring down—at any rate, with machine guns. Further, there is always a good chance that her gunners would hit a vital part of the attacking bomber, in which case there would be one enemy aircraft the less.

In the last resort, such as a collision, the crew would have parachutes, but if this occurred both aircraft would be lost and the profit and loss account would probably be to the advantage of the defence.

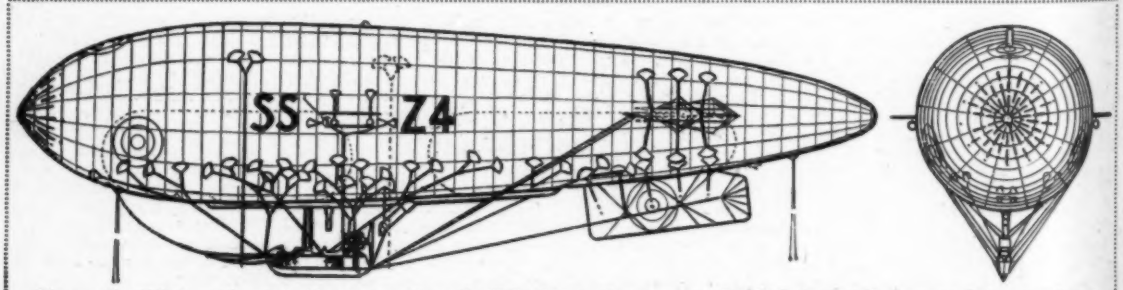
Experimental Facilities

It would seem that a number of such ships, drifting high up in predetermined positions, each in continuous wireless contact with ground stations, each under the orders of an officer on the ground who could direct them to get under power at any time and to proceed anywhere he thought necessary, would be a matter of great importance to anti-aircraft defence, especially as concerns the rapidity with which the earliest possible information could be transmitted. The scheme also has the advantage that it would be easy to experiment with in peace time.

Another advantage is that no great expense would be involved. There are still a number of dirigible sheds with hydrogen plants in various parts of the country. They would be perfectly suitable for the housing, overhauling and even constructing of airships of this type, and the Service must have numbers of old engines, obsolescent for modern aeroplanes, which would do admirably for these airships. The Napier Lion is a good example.

But there is one reason why this should be done now if it is to be done at all. There are hardly any experienced airship officers or men in the Service at present. On the retired list there are a number who have had much experience, and many of these must be still in good health, and, though somewhat over age, would make an admirable nucleus. They could command and man the earlier ships and, while doing so, would train younger crews. I do not doubt that most of the retired airship officers and men would be delighted to go back to the Service for this purpose. But in a few more years most of these will be too old, and if the matter was left it would be necessary to start without any experience of the practical operation of airships, and the development and crewing would be a very considerable difficulty, as everything would have to be relearnt. Hence, it is important to act now.

It remains to indicate a type of airship which would fulfil both these requirements, though the equipment carried would naturally differ according to the type of service required, the listening apparatus or the bombs being the main alternatives. I suggest that the North Sea type, developed towards the end of the Great War, if brought up to date and fitted with modern engines, would fulfil the requirements admirably. This airship had a gas capacity of 360,000 cubic feet, a disposable lift of 8,500 lb. and, fitted with two 250 h.p. motors, a maximum speed of 48 knots. One of these ships succeeded in remaining in the air for over 100 hours, but with modern engines of lighter weight and better fuel economy there is no doubt this figure could be easily exceeded. An airship of this size could have a machine-gun position on the top of the envelope if considered necessary. They were comfortable ships, the whole of the cabin accommodation being covered in by duralumin sheeting or fabric, and they carried their two engines on sponsons behind the nacelle. Possibly some of the sea-scouting work could be carried out by smaller airships of the S.S. type, and these small ships might be used for training, but this is rather a matter of detail.



The smaller S.S. type, drawn to the same scale as the N.S. above. A 70,000 cu. ft. ship, it carried a crew of three and was propelled by a single 75 h.p. engine.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

SEA LAWYER AND WARRIOR : A contrast in shapes and sizes is offered by this pose of a Vought V-143 single-seater fighter in the shade of a Sikorsky S-43 amphibian. The V-143 does 280 m.p.h. with a P. and W. Twin Wasp Junior and the amphibian 190 m.p.h. with two Hornets.

MRS. H. B. BONNEY reached Singapore on Monday on her solo flight from Brisbane to Capetown.

A number of machines with four 1,000 h.p. engines and accommodation for fifty passengers are being built in Italy for a service between Rome and Addis Ababa.

Mr. H. F. Broadbent took off from Sydney on Monday for Port Darwin whence he will make an attempt on the solo record for the Australia-England flight.

Miss Amy Johnson may leave a London airport on Coronation Day in her recently acquired Caudron Goeland to fly to Montreal with a batch of news reel films.

Wrights are experimenting with a new high-powered two-row radial known as the R-2600. Details are withheld, but it is reported that 26 of the new units have been ordered by Pan American Airways and 32 by T.W.A., presumably for installation in Boeing 307s.

Subject to official confirmation from the Air Ministry the new Cirrus Major 150 engine, described in *Flight* of April 1, completed its 100-hours type test last Thursday.

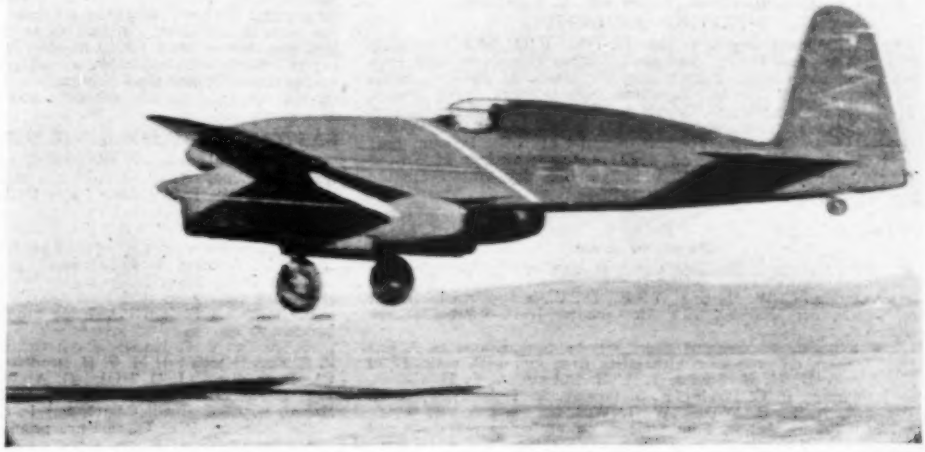
The fifteen Menasco engines which, as recorded on this page last week, have been ordered for installation in Dutch naval trainers, are destined for a series of Fokker S.9s.

"We do not hear sufficient of the aeroplane as a vehicle of transport, both for commerce and convenience, and we would like to see greater attention given to that aspect"—Lord Sempill, speaking at a luncheon given by the Japan Society in honour of the *Divine Wind's* crew. Lord Sempill made part of his speech in Japanese.

Capt. Frank Hawks' new monoplane (see page 382) is claimed to have flown from Washington to New York against a 30 m.p.h. wind in 48 minutes. The distance is 270 miles. The machine's estimated top speed is 378 m.p.h.

The latest Aeronca is a high-wing, strut-braced monoplane of greatly improved appearance. With the Aeronca E-113C engine of 40 h.p. it does 93 m.p.h. and has a cruising range of 250 miles.

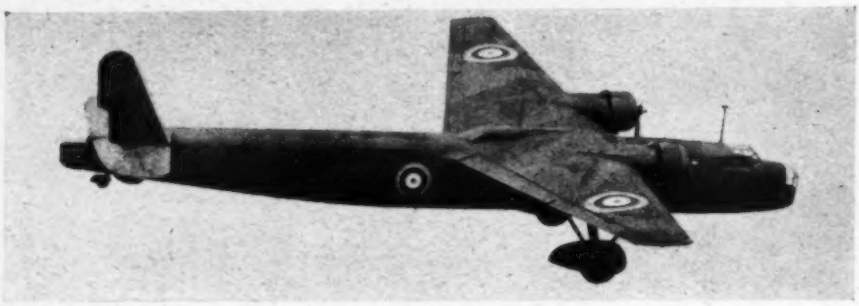
The Aero Club de Provence has issued an invitation through the R.Ae.C. to British private owners to participate in their Whitsun Tour on May 15, 16 and 17. Enquiries should be addressed to The Royal Aero Club, 119, Piccadilly, London, W.1.



COUPE DEUTSCH CUM COMET : With a view to attacking a number of long-distance records, including that for 5,000 km., the French pilot Rossi has been testing his Renault - engined Caudron Typhon at Istres aerodrome.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS



A SHADY CUSTOMER: "Shadow shading" is the Air Ministry's term for the new system of camouflage, here seen applied to a Handley Page Harrow. (*Flight* photograph.)

MORE NEW SQUADRONS

No. 76 (Bomber) Squadron formed at Finningley on April 12. The unit will be equipped with heavy bomber aircraft and will be placed in the Bomber Command, in No. 3 (Bomber) Group.

No. 105 (Bomber) Squadron will form at Harwell on April 26. The squadron will be equipped with medium bomber aircraft and will be placed in the Bomber Command, in No. 1 (Bomber) Group.

R.A.F. STAFF COLLEGE

The following officers passed the R.A.F. Staff College Qualifying Examination, which was held in January, 1937. Selection of officers to attend the next Staff College course will shortly be made and the names will be promulgated in May:—

Royal Air Force

Squadron Leaders.—G. B. Beardsworth, P. S. Blockey, C. S. Cadell, J. M. Cohu, R. Costa, J. G. Franks, G. W. Hayes.

Flight Lieutenants.—J. E. M. Bainbridge, G. Bartholomew, L. C. Bennett, S. L. Blunt, F. J. St. G. Braithwaite, H. Broadhurst, L. W. Cannon, B. A. Casey, J. C. Cunningham, A. E. Dark, C. W. Dicken, H. Ford, H. P. Fraser, R. K. Hamblin, E. C. Hudleston, W. H. Hutton, D. W. Lane, P. W. Lowe-Holmes, P. J. Mote (Equipment Branch), R. R. Nash, G. J. C. Paul, H. V. Satterly, J. N. T. Stephenson, R. W. K. Stevens, R. C. Storrar (Equipment Branch), H G. Wheeler, R. C. Wilson, F. R. Worthington.

Flying Officer.—H. A. Sudbury (Equipment Branch).

The following Dominion officers also passed the examination:—

Royal Australian Air Force

Flight Lieutenants.—M. O. Watson and W. G. Rae.

Royal Canadian Air Force

Flight Lieutenants.—C. B. Turner and R. C. Minnes.

FLYING ACCIDENT

The Air Ministry regrets to announce that P/O. John Barrington Pascoe-Webb and L.A/C. Raymond William Gibbs lost their lives in an accident which occurred near Miranshah, on April 13, to an aircraft of No. 27 (Bomber) Squadron, Kohat, India. P/O. Pascoe-Webb was the pilot of the aircraft and L.A/C. Gibbs the passenger.

The Ministry also regrets to report that Sgt. John Alfred Wardle lost his life in an accident which occurred at Brent Pelham, near Buntingford, Hertfordshire, on April 14, to an aircraft of No. 66 (Fighter) Squadron, Duxford, Cambridgeshire. Sgt. Wardle was the pilot and sole occupant of the aircraft.

FORMATION OF A BALLOON BARRAGE GROUP

No. 30 (Balloon Barrage) Group formed in the Fighter Command on March 17. The group will command the balloon depots and balloon barrage units on formation. The Group headquarters will be temporarily located at the headquarters of No. 6 (Auxiliary) Group, 33-34, Tavistock Place, London, W.C.1.

ARMY OFFICERS SECONDED TO THE R.A.F.

The Air Council have had under consideration, in consultation with the Army Council, the question of the promotion to the rank of Flight Lieutenant of Army officers seconded for duty with the Royal Air Force, and have decided as an exceptional and temporary measure to adopt the following scheme.

As from October 1, Army seconded officers will be eligible for promotion to Flight Lieutenant, with pay at the rate of 21s. 9d. a day, on completion of three years' service as flying officer, subject to their being certified as fit in all respects to hold the rank. Officers so promoted will be granted an antedate of one year's seniority as Flight Lieutenant on promotion to that rank. Officers will not be entitled to be paid as Flight Lieutenant for the period of the antedate, but they will be eligible for the rate of 23s. 6d. a day immediately on re-secondment, and will return to the Royal Air Force with two years' seniority as Flight Lieutenant.

REMUSTERING OF ARMOURERS AS FITTERS (ARMOURER)

It is anticipated that courses of twelve months' duration for converting armourers to the trade of fitter (armourer) will be introduced in the near future and will continue during the next two years. In order to be eligible for selection, airmen must (i) be recommended by their C.O.s as suitable for training as fitters (armourer); (ii) have completed not less than three years' service in the trade of armourer; (iii) be able to complete four years' service from the date of commencing training in the new trade or be willing to execute such extension of engagement as will enable them to complete not less than this period. For armourers serving on six-year engagements the minimum extension will be to complete nine years' service.

EASTCHURCH R.N.A.S. "OLD BOYS" ASSOCIATION

The nineteenth reunion dinner will be held at the Connaught Rooms, London, on Saturday, May 1, at 7 p.m. Applications should be made to W. J. Burridge, "The Durham Ox," Cambridge.

ROYAL AIR FORCE GAZETTE

Royal Air Force

General Duties Branch

Air Comdre. C. W. Nutting, O.B.E., D.S.C., is appointed Director of Signals, Air Ministry, vice Air Comdre. J. B. Bowen, C.B.E. (April 1).

The following are granted short service commissions as Acting Pilot Officers on probation with effect from and with seniority of March 15:—M. H. B. Davies, J. A. B. Dobson, A. C. H. Haines, R. J. Manton, F. C. Powles, F. S. Powley, A. T. Staveley, R. A. Towgood, N. E. R. Wilkes, W. J. Woods.

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers (December 13, 1936):—H. Budden, A. J. Goldie.

Acting Pilot Officer on probation V. G. L. D. Byrne is graded as a Pilot Officer on probation (January 6).

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—A. S. Q. Robins (February 24); D. R. Keiller, C. C. House (March 12); H. W. Dean, D. E. Turner, P. S. Foss (March 23); M. F. B. Read (seniority January 15) (March 27); F. G. Frow, J. O. Hinks, G. A. Walker (seniority October 1, 1936) (March 29); B. Ball, R. G. R. Buckley, B. K. Burnett, J. G. Munro, R. A. E. Traill (March 29); P. C. Lawrence (April 2).

The following Pilot Officers are promoted to the rank of Flying

Officer on the dates stated:—R. E. Baxter, S. C. Elworthy, P. J. Sanders, F. S. Stapleton (seniority June 3, 1936) (September 3, 1936); G. M. Fidler, W. F. Barton, C. W. K. Nicholls, R. E. Burns (February 24); J. Edwardes (March 6); J. Fulton (March 7); K. J. Mellor, H. J. Irens, G. E. Harrison, T. M. Tinker, L. J. Stickley, R. P. Widdowson, D. C. R. Macdonald, R. M. Coad, V. R. Oats (March 14); R. E. Dupont, G. M. Lindeman, R. D. Welland, V. C. Wood (March 26).

The seniority granted to Flt. Lt. C. I. A. Jackson (Capt., Royal Tank Corps) in the *Gazette* of September 15, 1936, is antedated to October 1, 1935); Flt. Lt. A. J. W. Geddes (Lt., Royal Artillery) is granted seniority in his present rank of October 1, 1935; Sqn. Ldr. C. Hallawell is granted the acting rank of Wing Commander (unpaid) (March 24); Air Comdre. J. B. Bowen, C.B.E., is placed on the half-pay list, Scale A (April 1); Flt. Lt. P. C. Fair is placed on the retired list at his own request (April 8).

The following Flight Lieutenants are transferred to the Reserve, Class A (March 31):—H. L. M. Glover, A. Moncrieff.

The following Flying Officers are transferred to the Reserve, Class A, on the dates stated:—H. J. F. Le Good (April 1); H. S. Miles (April 4).

Acting Pilot Officer on probation W. B. G. Bonsey resigns his short service commission (March 20); P/O. P. E. A. Talbot relinquishes his short service commission on account of ill-health (March 18).

The short service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty:—R. H. R. Hett (March 13); J. R. A. Jones (March 26).

Accountant Branch

Flying Officer on probation P. J. Holt is confirmed in his appointment (February 17).

Medical Branch

F/O. A. R. Sibbald, M.B., Ch.B., is transferred to the Reserve, Class D (March 25); F/O. J. Conroy, M.B., Ch.B., resigns his short service commission (March 24).

Dental Branch

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—O. F. Brown, L.D.S. (seniority October 1, 1936) (March 9); R. A. Pepper, L.D.S. (seniority December 1, 1936) (March 9); I. St. C. Alderdice, L.D.S., J. H. G. Fensom, L.D.S., S. Hill, L.D.S., W. A. H. Smith, B.D.S (March 9)

Chaplains Branch

The Rev A. H. Paget-Wilkes is granted a short service commission with the relative rank of Squadron Leader with effect from and with seniority of April 1.

Commissioned Engineer Officers

The following Flying Officers on probation are confirmed in their appointments on the dates stated:—B. H. Rolles (February 18); W. H. King, A. J. Nicholas, A. C. Oatway (March 18); H. R. Clowes (March 30).

Commissioned Armament Officers

The following Warrant Officers are granted permanent commissions as Flying Officers on probation with effect from and with seniority of March 22:—A. Davidson, J. J. Burton.

Flying Officer on probation L. A. Bett is confirmed in his appointment (March 18).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

A. Andrew is granted a commission as a Flight Lieutenant in Class A. with effect from March 30 and with seniority of February 7; E. J. Gracie is granted a commission as Flying Officer in Class A with effect from and with seniority of March 23; J. S. Dick is granted a commission as Flying Officer in Class A with effect from April 6 and with seniority of November 16, 1929; Capt. D. E. Ward is granted a commission as a Flight Lieutenant in Class C (February 15); F/O. B. L. Young is transferred from Class A to Class C (August 17, 1936); F/O. R. S. Gleadow is transferred from Class AA (ii) to Class C (July 1, 1936); Flt. Lt. S. H. Potter is transferred from Class C to Class A (October 24, 1936).

The following Flying Officers are transferred from Class C to Class A on the dates stated:—R. W. Barton (May 22, 1936); F. D. Travers, D.F.C. (December 5, 1936).

Flt. Lt. A. D. McDowall relinquishes his commission on completion of service and is permitted to retain his rank (March 15); F/O. J. J. Hickman relinquishes his commission on completion of service and is permitted to retain his rank (March 18).

The following Flying Officers relinquish their commissions on appointment to commissions in the Auxiliary Air Force:—The Hon. J. Grimston (January 14); E. C. Fieldsend (January 26).

Pilot Officer on probation J. M. Scott relinquishes his commission on completion of service (March 14). The notification in the *Gazette* of March 17, 1936, concerning F/O. E. P. Young is cancelled.

AUXILIARY AIR FORCE

General Duties Branch

No. 500 (COUNTY OF KENT) (BOMBER) SQUADRON.—Flt. Lt. A. Andrew ceases to be attached to the Royal Air Force (March 23); Flt. Lt. A. Andrew relinquishes his commission on appointment to a commission in the Reserve of Air Force Officers (March 30).

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—The Hon. J. Grimston is granted a commission as Pilot Officer (January 14).

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—R. E. W. Pumphrey is granted a commission as Pilot Officer (March 13).

No 611 (WEST LANCASHIRE) (BOMBER) SQUADRON.—E. C. Fieldsend is granted a commission as Flying Officer (January 26).

General List

Sqn. Ldr. A. S. W. Dore, D.S.O. (Lt.-Col.) (Hon. Wing Cdr.) is appointed to the General List in the rank of Wing Commander (June 1, 1936).

AUXILIARY AIR FORCE RESERVE OF OFFICERS

General Duties Branch

A. C. M. Jackaman is granted a commission as Flying Officer in Class A (March 9); F/O. F. W. Hancock is transferred from Class A to Class C (February 22); Sqn. Ldr. A. S. W. Dore, D.S.O. (Lt.-Col.) (Hon. Wing Cdr.) relinquishes his commission on appointment to the General List (June 1, 1936).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the R.A.F. are notified:—

General Duties Branch

Air Commodore.—C. W. Nutting, O.B.E., D.S.C., to Directorate of Signals, Air Ministry; on appointment as Director of Signals, vice Air Comdre. J. B. Bowen, C.B.E., 1.4.37. J. H. S. Tyssen, M.C., to Headquarters, No. 12 (Fighter) Group, Uxbridge, Middlesex; for duty as Senior Air Staff Officer, 1.4.37.

Wing Commanders.—H. A. Whistler, D.S.O., D.F.C., to Headquarters, R.A.F., India; on appointment as Instructor at the Staff College, Quetta, 22.2.37. J. H. Butler, to No. 2 (Indian Wing) Station, Risalpur; to command, 17.3.37.

Squadron Leaders.—S. H. V. Harris, to No. 39 (Bomber) Squadron, Risalpur, India; to command, 17.3.37. R. Costa, to No. 27 (Bomber) Squadron, Kohat, India; to command, 17.3.37. J. G. Hawtrey, to Headquarters, R.A.F., India, for course at Staff College, Quetta, 22.2.37. E. T. Carpenter, A.F.C., to Headquarters, Bomber Command, Uxbridge, Middlesex; for Signals duties, 1.4.37. H. L. Rough, D.F.C., to No. 75 (Bomber) Squadron, Driffield; for flying duties, 31.3.37. R. H. Donkin, to No. 10 Flying Training School, Tern Hill; for duty as Chief Ground Inspector, 24.3.37. J. S. Harrison, to Headquarters, R.A.F., Middle East, Cairo, Egypt; for Personnel Staff duties, 30.3.37.

Flight Lieutenants.—H. L. Messiter, to Headquarters, R.A.F., Middle East, Cairo, Egypt, 30.3.37. L. W. C. Bower, to No. 202 (Flying Boat) Squadron, Malta, 30.3.37. H. McC. White, to Aircraft Depot, Karachi, India, 1.3.37.

Flying Officer.—J. A. H. Tuck, to Aircraft Park, Lahore, India, 10.3.37. L. W. Saben, to R.A.F. College, Cranwell, 31.3.37. W. H. Kearney, to No. 203 (Flying Boat) Squadron, Basrah, Iraq, 5.4.37.

Pilot Officer.—G. Burges, M. F. C. Farrar, to No. 202 (Flying Boat) Squadron, Malta, 30.3.37.

Acting Pilot Officers.—C. P. Cattell, G. L. Fraser, A. Gammie, R. F. Marrack, M. H. B. Davies, J. A. B. Dobson, A. C. H. Haines, R. J. Manton, F. C. Powles, F. S. Powley, A. T. Staveley, R. A. Towgood, N. E. R. Wilkes and W. J. Woods, to No. 4 Flying Training School, Abu Sueir, Egypt, 30.3.37. B. Statham, to No. 9 Flying Training School, Thornaby, 29.3.37. G. C. Gauthier, E. J. P. Jackson, G. A. McWhinney, L. F. M. Saunders, S. G. Stilling and E. W. Young, to No. 4 Flying Training School, Abu Sueir, Egypt, 3.4.37. P. R. Austin-Sparks, W. R. le H. Beatty, D. N. Collins, J. R. Cruttwell, J. Dunn, R. H. Immelman, A. I. Robinson, G. A. Lane, C. S. P. Russell, D. L. Vercoe, V. H. Ayres, R. D. C. Chambers, A. H. C. Cox, H. W. Currie, A. K. Furse, N. Johnson, A. F. Russell, E. C. Wheelwright, H. B. Barton, C. E. Bowen, G. E. P. Green, W. B. Keddy, P. F. King, W. N. Lepine, J. P. Mitchell, S. J. D. Robinson, P. L. B. Morgan, W. P. Bain, J. A. Campbell, P. F. Illingworth, T. H. Kilroy, E. H. W. Kirk, A. McL. Mackinnon, J. A. Piddington, D. F. J. Willis, J. G. Howard, M. D. Donati and N. F. Morris, to No. 9 Flying Training School, Thornaby, 20.3.37.

Equipment Branch

Flight Lieutenant.—R. B. Brown, to R.A.F. Station, Scampton, 30.3.37.

Medical Branch

Wing Commander.—R. S. Overton, to R.A.F. Depot, Uxbridge, Middlesex; for duty as Medical Officer, 6.4.37.

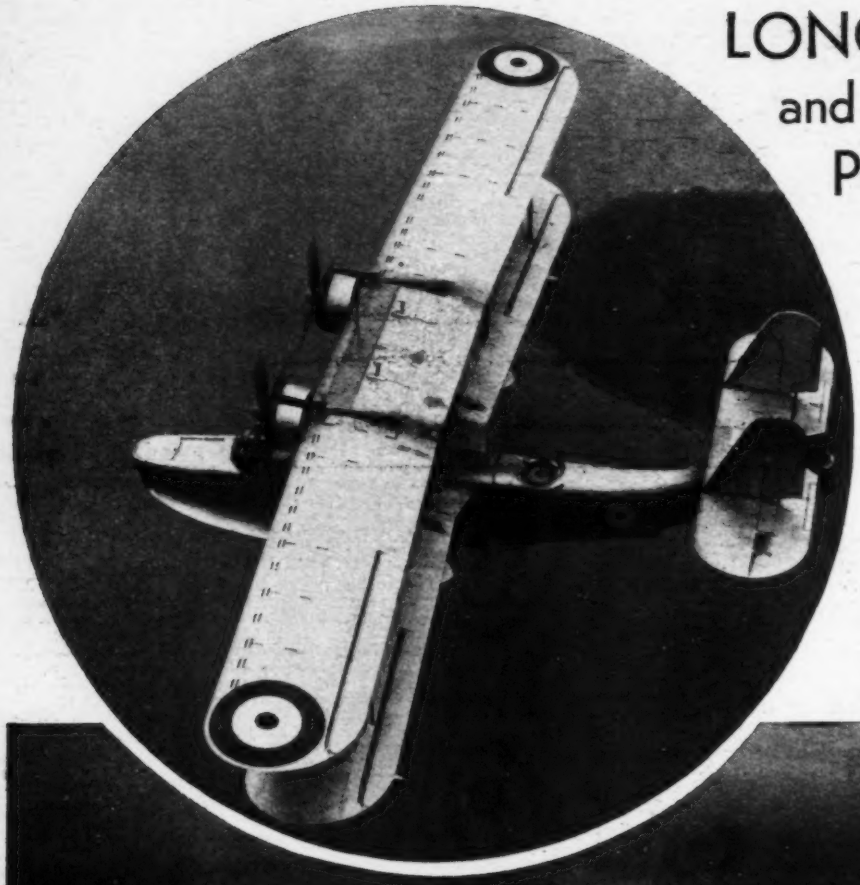
Flight Lieutenants.—R. E. Alderson, to R.A.F. General Hospital, Palestine and Transjordan, Sarafand, 12.3.37. R. A. Cumming, to No. 203 (Flying Boat) Squadron, Basrah, Iraq, 9.3.37. J. R. Sellars, to R.A.F. Station, Amman, Palestine, 12.3.37.

Flying Officers.—J. H. Lewis, to No. 2 Flying Training School, Digby, 5.4.37. S. Paul, to No. 7 Flying Training School, Peterborough, 5.4.37. E. S. Sidey, to No. 1 Flying Training School, Leuchars, 5.4.37.

Chaplains Branch

Revd. F. D. Morley, to R.A.F. Depot, Middle East, Aboukir, Egypt; for duty as Chaplain (Methodist), 1.4.37.

LONG RANGE and STRIKING-POWER



BOTH the Vickers-Supermarine Stranraer flying boat illustrated on this page and the Vickers Wellesley medium bomber on the next have qualities which distinguish them in their respective classes. Each is the subject of an Air Ministry contract.

The Stranraer, the first production model of which is seen here, can be used for reconnaissance, bombing and torpedo transport (not torpedo dropping), and is

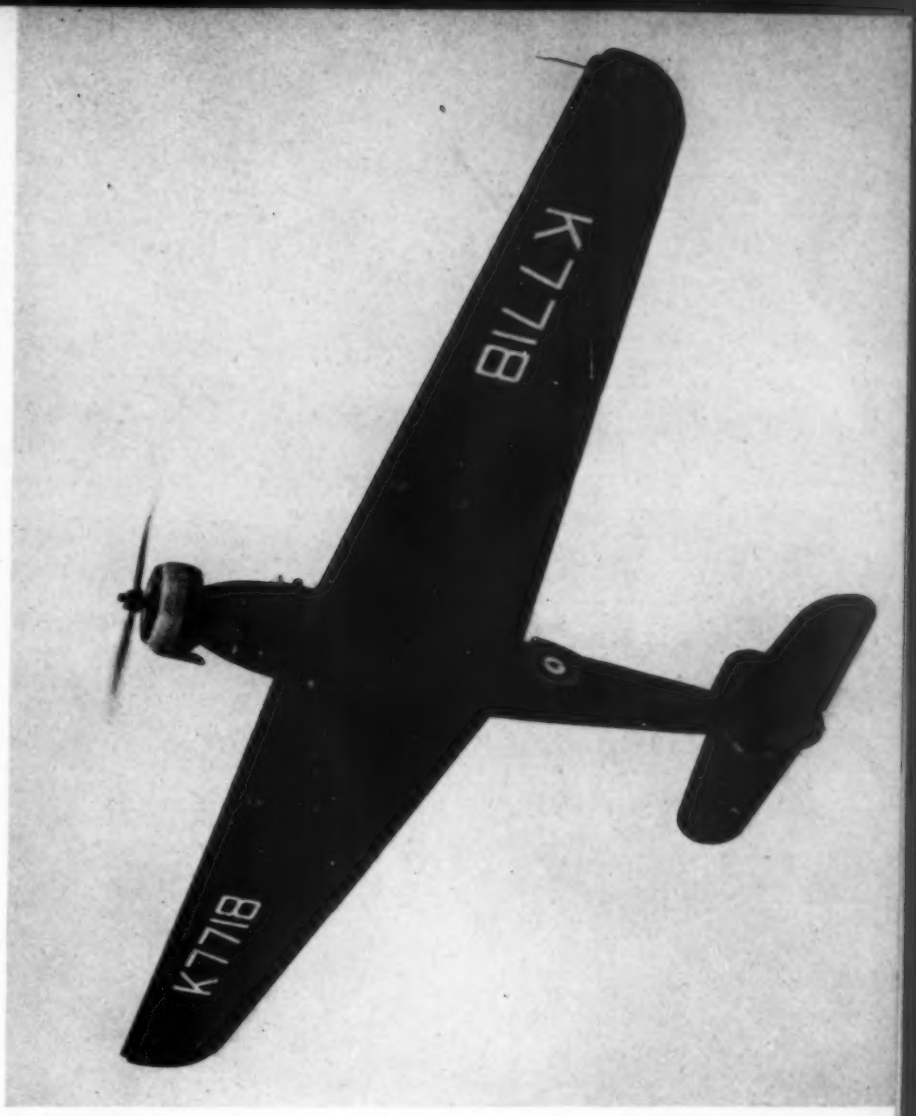
fitted with two 850 h.p. Bristol Pegasus Xs, driving three-bladed, fixed-pitch Fairey metal airscrews. A maximum speed of over 160 m.p.h. is attained, and the normal range may be increased by using the "bomb tanks" seen in position.

The Vickers Wellesley on the right was originally built to a specification for general-purpose aircraft, but so great were its potentialities, thanks to fine aerodynamic design and the Wallis system of geodetic construction employed, that it was subsequently classed as a medium bomber. Performance data may not be disclosed, but the range of the Wellesley, when made known, will undoubtedly cause something of a sensation.

A De Havilland variable-pitch airscrew is specified for the Pegasus engine, and the undercarriage is completely retractable. Pilot and observer are housed in separate cockpit enclosures.

It will be noted that the Wellesley is camouflaged in accordance with the recently announced policy of the Air Ministry to treat bombers and Army co-operation aircraft with a scheme of "shadow shading."

21 (*Flight* photographs.)



PREPARACHUTING

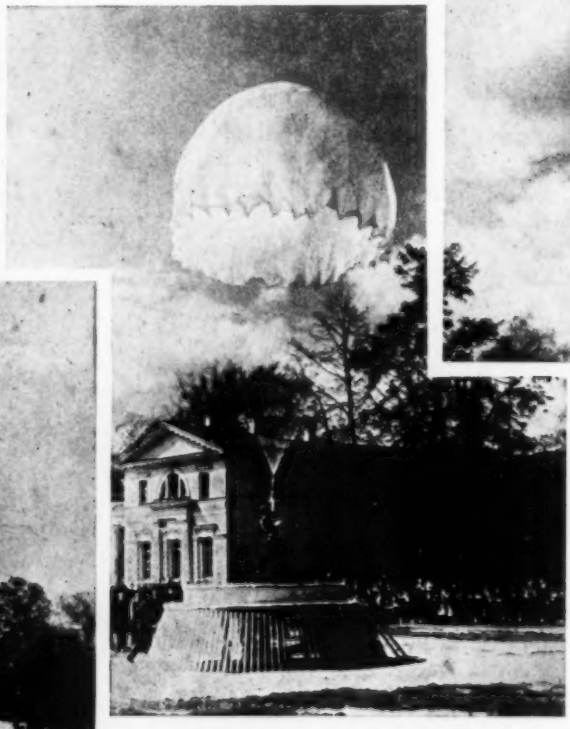
Nerve-soothing Training Methods Now Being Adopted in the United States and European Countries : Teaching the Troops

FROM an airman's rather hazardous last hope the parachute has developed into a reliable lifeboat. In the last year or two it has also become a method of military offence and an amusement park attraction.

In this country the usual form of training in the use of a parachute is verbal instruction in the art of getting free of an aircraft, in pulling the cord at the right moment and in landing and folding the parachute afterwards. This is very valuable so far as it goes, but until several actual descents have been made it is unlikely that the pupil will feel normal and balanced enough to make correct emergency use of verbal instructions, probably given many months previously.

Due to the simplicity and efficiency of modern parachutes, the first drop, which must be in the nature of an adventure, is very likely to be a successful one so long as the cord is pulled at some point, even though the previous instructions are forgotten. The touch-down still remains the moment at which the unskilled parachutist is most likely to damage himself.

Since the use of parachutes has been extended to the dropping of supplies, ammunition, mail, and even live animals, experiments in certain countries have shown that it is now well within reason to visualise the dropping of large forces with equipment, supplies, machine-guns, and even small field guns behind enemy lines. During recent manœuvres, according to reports from Russia, 1,200 men, 150 machine-guns, and 18 light field guns were dropped behind supposedly enemy lines and were assembled and under control in eight minutes. For these reasons, among others, parachute training has attracted considerable attention. The American Armament Corporation, for example, has developed a scheme which has been operating successfully in America for two summer seasons. Towers 250ft. high are used, and the aspiring parachutist is broken-in in stages. First there is the captive drop with a seat instead of harness to give confidence. The pupil is strapped into the seat attached to the 'chute cords and hoisted up to the top of the tower. The skirt of the 'chute is kept open by a ring and guided in the descent by vertical wires. On reaching the top, the ensemble, including pupil, is released and descends to the ground supported only by the buoyancy of the parachute. The downward movement is arrested gently just before reaching the ground. This gentle treatment causes the pupil to lose any fear that he or she may have felt and dispels the idea that the para-



THE SOVIET BLOW-YOU-UP SCHEME : Like a slow motion film in reverse, the parachutist braces himself on the ground, unfurls his parachute, and ascends.

A "third phase" free drop from an American training tower commences with canopy extended. The pupil is strapped in standard harness and learns to make a steady two-point landing.

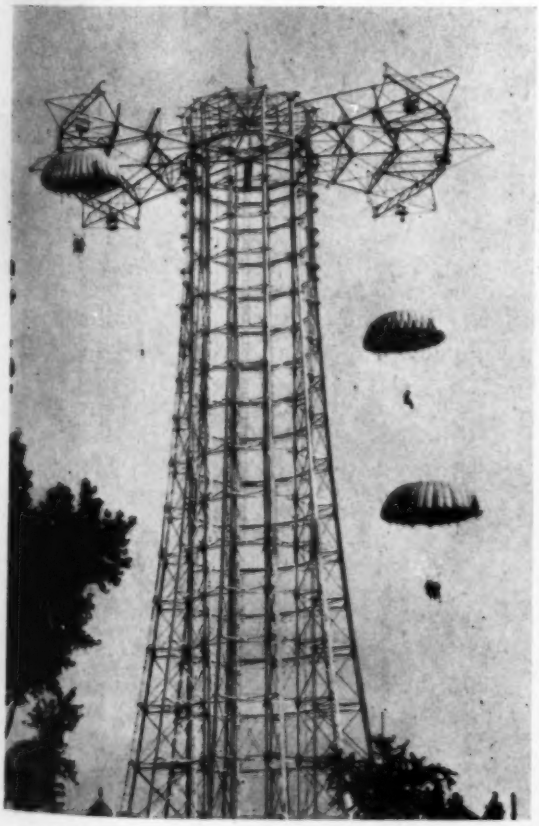
chute might ultimately fail to open.

In America more than 100,000 passengers, ranging from 3 to 70 years of age, have made such "first-phase" descents from the various towers without a single accident.

A second-phase drop is similar to the first, but the seat is replaced by a standard harness, and the method of landing enables the pupil to practise relaxing and braking the fall with his or her feet. There is, of course, no drift to cope with at this stage.

Phase three marks a considerable advance, being the first entirely free drop. A rotating top to the tower allows the 'chute to be trimmed downwind, and, on release, open, from the hoisting hook the parachute drifts the pupil away and down, while the instructor below can give instructions under actual drop conditions. Landing and handling in the air and on the ground can all be practically taught in this way.

The fourth phase in the training commences with a packed parachute. The pupil has a rip cord and learns not to pull it until, under flying conditions, the 'chute would open clear of the aircraft. If the cord is not pulled within 75ft. an automatic safety device comes into play.



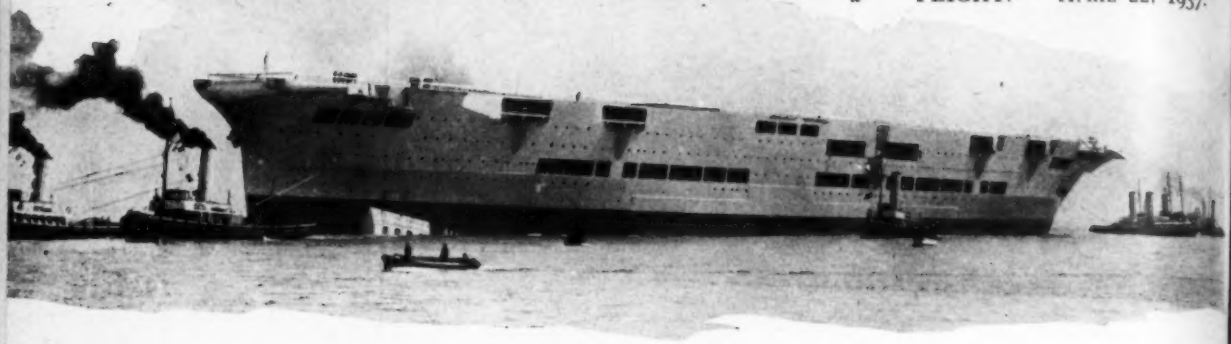
Incidentally, quotations for the erecting of a tower and the complete equipment to go with it can be obtained from W. S. Shackleton, Ltd., 175, Piccadilly, London, W.1, who represent the American Armament Corporation.

More experiment and practice with parachutes has been carried out in Russia during the last few years than in any other country, and mass parachute descents of several hundred men and women have been made. A recent idea to be adopted does away with the necessity of either a tower or an aeroplane. In this method the parachutist stands in harness with 'chute open over a grille, and a blast of air from a propeller beneath it does the rest.

Italy has recently shown practical interest in tower jumping, and France has announced experiments made in the dropping of troops, as in Russia, but it is felt in authoritative circles in this country that, although it might prove most useful in general second-class warfare in many parts of the world, it would not be a practical manœuvre in modern European warfare.

M. A. S.

BANK HOLIDAY "PAIR-O-CHUTES": In the amusement class are this huge American tower with two-seater equipment (left), and brightly illuminated affair in Gorki Park, Moscow (right). A 200ft. tower is being built for the Paris Exhibition.



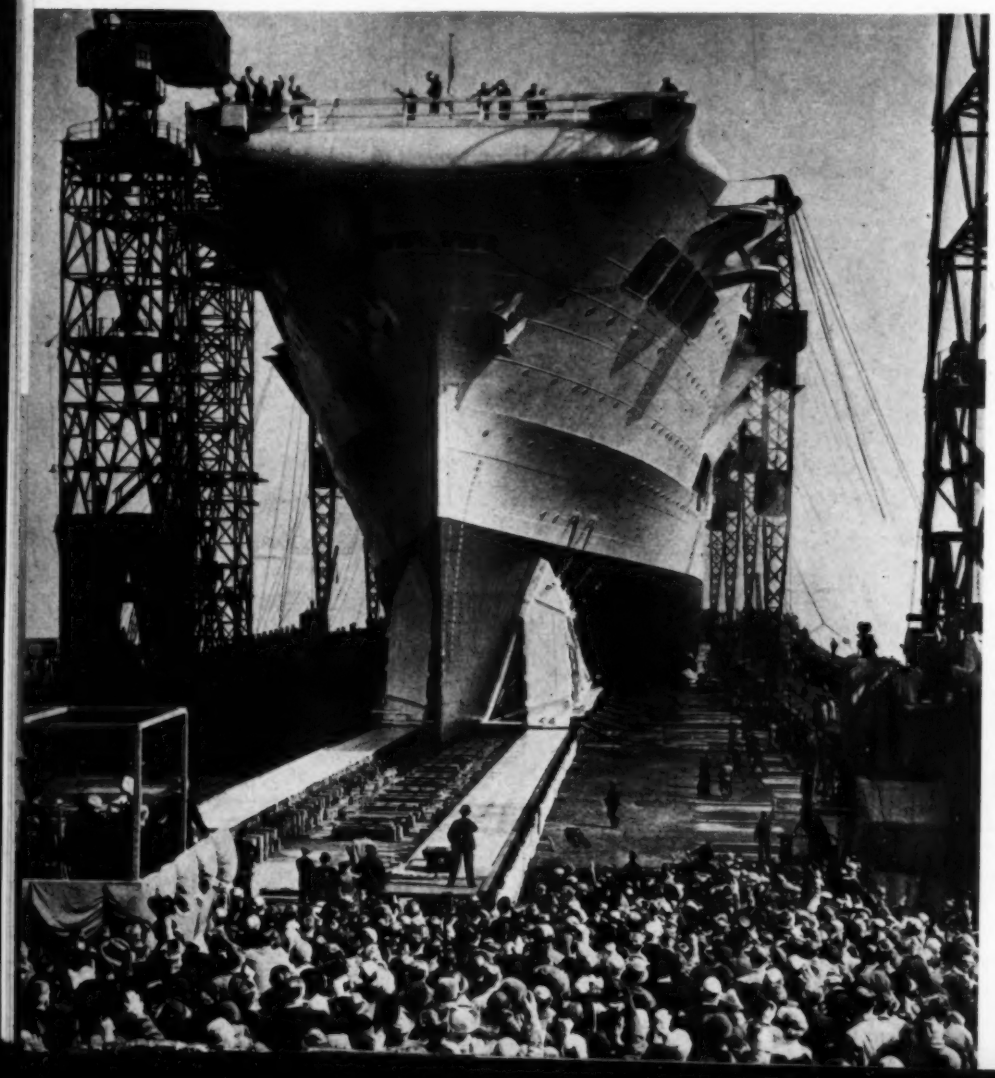
ARK ROYAL

The World's Most Modern Aircraft Carrier Launched for the Navy

APART from the *Hermes* the aircraft carrier *Ark Royal*, launched from Cammell Laird's Birkenhead yards on Tuesday of last week, is the first vessel of its kind to be designed specially for the large-scale operation of aircraft. Construction is already under way on two additional vessels, *Illustrious* and *Victorious*, both of which are scheduled for completion in 1939.

The *Ark Royal* should be commissioned next year, until which time, presumably, detailed information is being witheld. It is known, however, that she displaces 22,000 tons, is 685 feet long, measures 94 feet in the beam, and draws 23 feet of water. Her armament will consist of 4.5in. guns.

Unofficially, it is stated that she has stowage for about seventy aircraft and that she will be driven by her Parsons geared turbines at a maximum speed of "something in the neighbourhood of 30 knots." Apparently she will have high-pressure water-tube boilers of the three-drum type.



Her striking hull lines are brought out in the accompanying views. It is said that her detail design will embody several improvements making for augmented efficiency of flying operations and of aircraft stowage.

Together with the *Illustrious* and *Victorious*, the *Ark Royal* will add greatly to the Navy's aerial strength. It will be recalled that present plans envisage doubling the numerical strength of the Fleet Air Arm, the present establishment of which is 217 first-line machines, of which 160 are operated from aircraft carriers.

Excluding the *Argus*, which is used mainly as a floating base for Queen Bee radio-controlled target aircraft, the five British carriers at present in service have a total capacity of 165 aeroplanes. These vessels are the *Courageous* and *Glorious* (22,500 tons), *Eagle* (22,600 tons), *Furious* (22,450 tons) and *Hermes* (10,850 tons).

H.M.S. *Pegasus*, from which the name *Ark Royal* has been transferred, is on hand for experimental work with catapults, etc.

The launching ceremony of H.M.S. *Ark Royal* in progress at Birkenhead.

HERE and THERE

The Aerial Donkey Engine : From Photography to Pyrotechnics : Italy's Ten-ton Records

Big Engines Have Lesser Engines . . .

FOR a number of years A.B.C. Motors, Ltd., of Walton-on-Thames, Surrey, have made small auxiliary power units designed to perform a multitude of duties on flying boats and other large aircraft.

Their latest unit of this type is air-cooled by a fan. An overhead-valve flat twin, it develops 5 h.p. at 4,000 r.p.m. Neatly and compactly built into the unit are a 350-watt dynamoter and a gear box by which the engine may be made to drive, as required, a refuelling pump, a bilge pump, and two air compressors.

The refuelling pump is rated to deliver 2,000 gall./hr. against a head of 10 ft. and the bilge pump 2,500 gall./hr., both with a vertical suction lift of 16 ft. through a 1½ in. bore pipe. The air compressors together charge an air bottle of 400 cu. in. capacity to a pressure of 200 lb./sq. in. in 2½ min.

Fuel consumption of the engine is 2.5 pts./hr., and the weight is 142 lb. with compressors or 128 lb. without.

Hold It!

ONCE upon a time the nocturnal Press photographer transfixed his victims with a shattering broadside of magnesium powder. Nowadays he uses a neat little flash bulb, and facial expressions of serenity and innocence replace the petrified fear-masks of yesteryear.

The General Electric Company, who make the Sashalite flash bulb (which contains aluminium foil in low-pressure oxygen, ignited by an electric contact), have now discovered a new use for this device. Mr. J. C. M. Gibb (who, incidentally, instructs at Broxbourne at week-ends) is the member of their organisation responsible. The bulbs are coloured red, green, or any shade required, and made to perform the duties of Very lights, their safety qualities being a point strongly stressed.

While their brief flash—it is 1/75th of a second in the case of the normal photographic Sashalite—obviously limits their use to circumstances when they are being definitely watched for, the bulbs give an intense light that can be seen at very great heights or in poor visibility. Actual tests have proved this to be the case.

By a special arrangement, a number of differently coloured bulbs can be fired in quick succession to give a prearranged code signal. Recognition signalling in war-time is obviously one of the most valuable applications of the idea.

The Aero Golfing Society

THE annual golf match between the R.A.F. stations at Martlesham and Felixstowe and the Aero Golfing Society was played at Felixstowe on Saturday, April 10.

In the foursomes each side won three matches with one halved, while in the singles the Aero Golfing Society were successful by seven matches to five with two halved.

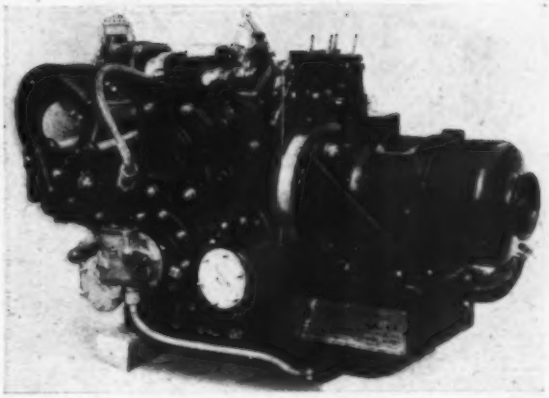
The Lowe-Wylde Fund Closed

AS announced in last week's issue, the Lowe-Wylde Memorial Fund has closed at a sum slightly above the intended total.

The Fund was started in the summer of 1935, with the object of providing for the three orphan children of C. H. Lowe-Wylde, who was killed in 1933 while testing an ultra-light monoplane of the type from which the Drone has been evolved. It was inaugurated at the instance of Mr. E. C. Gordon England, managing director of General Aircraft, Ltd., and a board of trustees consisting of Lord Sempill, Kathleen Countess of Drogheda and Air Comdre. J. A. Chamier.

As the lists of acknowledgments published from time to time in *Flight* have shown, subscriptions were received steadily, if slowly, until, on April 9, a total of £1,137 9s. 6d. was reached, a figure slightly in excess of the £1,100 aimed at. One or two further donations have been received since the closing date.

Of the total, £700 is invested at 3 per cent. with the Woolwich Equitable Building Society. It is proposed to invest a further £200 immediately. The sum of £187 14s. 6d. has already been expended on school fees, leaving a bank balance of £49 15s.



The new A.B.C. auxiliary engine described in the adjacent column.

The administrative expenses of the Fund, including £12 expenditure on postage, have been borne by the organiser, Mr. Gordon England.

The three children are at St. Elizabeth's House, Bullingham, Hereford, and Mr. Gordon England states that satisfactory reports are received from time to time.

The final list of donations, which brought the Fund from £1,000 up to the closing total, is as follows:—

£20.—Lord Weir of Eastwood.

£10 10s.—Supermarine Aviation (Vickers), Ltd.

£5 5s.—Accles and Pollock, Ltd., British Airways, Ltd., W. C. Devereux, Lt.-Col. W. A. Bristow, C. L. Walker.

£5.—Robert A. Bruce, A. Ogilvie.

£3 3s.—Charles Ball, F. A. Bumpus, Brig.-Gen. P. R. C. Groves.

£2 2s.—A. V.-M. J. E. A. Baldwin, Capt. F. S. Barnwell, J. M. Furnival, Oscar T. Gnosspelius, J. S. Irving, R. P. Key, P. C. Lombardini, J. W. Massey, Sir Francis McClean, Capt. L. F. Plugge, A. J. Rowledge, F. R. Simms.

£1 1s. 6d.—Baker and Walls, Ltd.

£1 1s.—M. A. Adam, Anon., Prof. L. Bairstow, E. L. Bass, Sqn. Ldr. H. F. V. Battle, L. E. Baynes, J. A. J. Bennett, G. Blondeau, F. B. Bradfield, Mrs. M. Burton, J. F. Cleveland and Co., Marshal of the Royal Air Force Sir Edward Ellington, Harry Ferguson, H. E. Fozard, J. M. Grice, P. T. Griffith, Air Marshal Sir John Higgins, F. T. Hill, M. Shadwell Hooper, Group Capt. G. H. Hynes, Marcus Langley, J. A. McMullen, H. A. Mettam, Lt.-Col. J. T. C. Moore-Brabazon, Jean Pontremoli, Group Capt. Harold Primrose, G. Tilghman Richards, Prof. A. Robertson, Capt. Smith-Clarke, G. H. Volkert, Capt. G. S. Wilkinson, H. N. Wylie.

10s. 6d.—Richard M. Clarkson, William G. Gould, A. C. Hodgson, A. N. Jackson, J. Johnston, E. T. Jones, H. E. Preston, H. B. Wyn-Evans.

10s.—F. J. Wingfield Digby, H. T. Edgecombe, L. Howard Flanders, J. A. G. Haslam, Clifford W. Tinson.

No. 45 Squadron Reunion

NO. 45 SQUADRON R.F.C. and R.A.F. will hold its 21st birthday and eleventh annual reunion dinner at the Crown and Cushion Restaurant, London Wall, E.C.2, on Saturday, May 1, at 6.30 p.m., for all war-time ranks.

This Week's Italian Record

THE last two issues of *Flight* have chronicled two world's records for speed over 100 km. and 1,000 km. gained by the Italian Furio Niclot in a Breda 88 bomber-fighter. The newest contribution to Italy's impressive tally of records has been made by Mario Stoppani, who, on April 13, took a Cant. Z.508 flying boat fitted with three Isotta-Fraschini engines to 4,863 metres, carrying a load of 10 tons, thus beating, it is claimed, the international height record for seaplanes carrying such a load (Class C. bis) as well as that for the biggest load carried by seaplanes over 2,000 m. The former height record in the same category was held by the Russians Riabelik and Illinski who, on December 8 last year, attained 1,942 m. on an A.N.T. six-engined seaplane of 4,800 h.p. With about half the power the Italians carried the same load to more than double the height.

The record for the highest load carried to 2,000 m. was held by a Sikorsky S.42 (four Hornets giving a total of 2,700 h.p.) which, on May 17, 1934, carried 7,533 kg. to 2,000 m.

A high-wing flying boat for military use, the Cant. Z.508 may be considered as an enlarged and triple-engined development of the Cant. Z.501 single-engined machine which twice set up long-distance records for seaplanes by flying from Monfalcone to Massua and to Berbera (British Somaliland).

The engines are three Isotta-Fraschini Asso XI RC. 40s giving 836 h.p. at 13,000 ft. at 2,250 r.p.m. and 860 h.p. for three minutes at take-off at 2,140 r.p.m. A twelve-vee liquid-cooled model, the engine has a capacity of 32.646 litres.

THE WEIGHT OF AIRSCREWS

Capt. F. S. Barnwell, O.B.E., A.F.C., B.Sc. (Eng.), F.R.Ae.S., on the Increase of Specific Weight with B.H.P. : Hollow Blades the Solution ?

MODERN tendency in aero engine development is towards greater and greater power from a single unit. At Mr. Fedden's lecture recently Mr. Lipscomb raised the question of airscrew diameter to go with high power, and pointed out that tip speeds in the region of the speed of sound might be reached, with resultant objectionable noise and loss of efficiency. In the note below Capt. Barnwell, chief aircraft designer of the Bristol Aeroplane Co., Ltd., calls attention to what appears to be a fundamental physical law in relation to specific airscrew weight.

Capt. Barnwell comes to the conclusion that with "geometrically similar" airscrews the weight per horsepower increases with power, so that unless means can be found to introduce refinements comparable with those which in aircraft construction have enabled designers to "cheat" the so-called cube law to some extent, the airscrew for absorbing very large horsepower will be of prohibitive weight. He suggests, as a design refinement, making the blades hollow, on the assumption that it is less difficult to make a large blade hollow than a small one.

The concluding paragraph of Capt. Barnwell's covering letter to the Editor is so typically Barnwellian that we cannot refrain from quoting it. "The Note," it states, "perhaps suggests proving that two plus two makes four. If this be so, it would mean at least that the argument is incontrovertible, and it is possible that it is a matter not recognised at present as fully as it should be."

The Calculation

If one assumes :

Constant geometric proportions and shape, constant value for air-speed v, constant value for product nD (n being airscrew revolutions per second and D being airscrew diameter in feet), constant air density.

It follows that power absorbed by airscrew

$$P_A = K_1 n^3 D^5 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (1)$$

But, as nD is constant

$$n = \frac{K_2}{D} \quad .. \quad .. \quad .. \quad .. \quad .. \quad .. \quad (2)$$

Whence, from (1) and (2) :—

$$P_A = K_3 D^2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (3)$$

or $$D = K_4 \sqrt{P_A} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (3A)$$

That is to say :—

Diameter of airscrew varies as square root of power absorbed.

Assuming constant density for airscrew, i.e., same material, it follows that weight of airscrew

$$W = K_5 D^3 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (4)$$

Hence, from (3) and (4) :—

$$W = K_6 (P_A)^{3/2} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (5)$$

or $$\frac{W}{P_A} = K_7 \sqrt{P_A} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (6)$$

That is to say :—

Weight of airscrew varies as horsepower raised to the 3/2 power, or weight of airscrew per horsepower varies as square root of horsepower.

As regards the stresses on the airscrew under the foregoing assumptions :—

As there is geometric similarity and constant tip-speed, it follows that efficiency will be constant and disposition of air load along the blade also constant, hence airload on blade

$$L = K_8 P_A = K_9 D^2 \quad .. \quad .. \quad .. \quad .. \quad (7)$$

and bending moment due to air load, across any particular cross-section

$$M = K_{10} LD = K_{11} D^3 \quad .. \quad .. \quad .. \quad .. \quad (8)$$

But modulus of section varies also as does D^3 ; hence it follows that unital stress (say in tons per square inch) at any particular point on the blade, due to air-load bending, is constant.

Again, as there is geometric similarity and constant density of material, it follows that the centrifugal pull across any particular cross-section

$$F = K_{12} D^4 n^2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (9)$$

But the area of any particular cross-section varies as D^2. Hence it follows that unital stress, due to centrifugal pull,

$$f = K_{13} D^2 n^2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (10)$$

Whence, since nD is constant, it follows that unital stress (due to centrifugal pull) across any particular section is constant.

From this it will be seen that the assumptions which have been made give an airscrew *of constant strength*.

From all the foregoing it is seen that if speed of flight, air density and tip-speed all be constant, and if strength is to be kept constant (all of which are entirely reasonable postulates),

(1) Diameter of airscrew varies as square root of horsepower.

(2) R.P.M. of airscrew varies as reciprocal of square root of horsepower.

(3) Weight of airscrew varies as horsepower raised to the 3/2 power.

This appears fundamental and implies that the weight of the airscrew per horsepower necessarily increases as horsepower increases and may well become "prohibitive" for very high powers.

To quote a few illustrative figures, using data which are reasonably well established :—

Speed assumed as 273 m.p.h. (400 ft./sec.) at 15,000 ft.; tip-speed assumed as 1,000 ft. per second :—

B.H.P.	D (ft.)	R.P.M.	Weight (lb.)	Wt./h.p.(lb.)
1,000	11.6	1,510	280	0.280
2,000	16.4	1,070	792	0.396
3,000	20.1	870	1,455	0.485
4,000	23.2	755	2,240	0.560
5,000	25.95	675	3,130	0.626

THE SWING OF THE PENDULUM?

THE sole high-powered liquid-cooled American-built engine available in the U.S.A. for some years has been the Curtiss Conqueror, the major energies of the big manufacturers (including Curtiss-Wright) having been directed toward radial development. Animated, no doubt, by the excellent results obtained in the eastern hemisphere with liquid-cooled power plants (notably, one gathers, the Rolls-Royce Kestrel and Merlin) at least one American concern, the Allison Engineering Company, of Indianapolis, has been developing a unit on similar lines.

The Allison V-1760-C6, brief data on which have just been released, is a "hot-cooled" twelve-cylinder vee rated by the manufacturers at 1,000 h.p. at 2,600 r.p.m.

A chrome nickel molybdenum steel forging, the crankshaft is set in an aluminium alloy crankcase. The cylinders have cast aluminium heads and the connecting rods are chrome nickel molybdenum steel forgings.

Preliminary data are : Compression ratio, 6 : 1 ; blower ratio, 6.75 : 1 ; reduction gear ratio, 2 : 1 ; bore, 5.5in. ; stroke, 6in. ; displacement, 1,710 cu. in. ; length, 94.47in. ; width, 28.94in ; height, 40.72in. ; weight (with magneto, carburettor, airscrew hub cones and nut, coolant pumps and pipes, provision for v.p. airscrew and drives for tachometer, fuel pump, vacuum pump and generator), 1,280lb. ; and fuel consumption at rated power operating on fuel of 87 octane number, 0.6lb /b h.p./hr.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

NORTH SEA TERMINUS ; When the Newcastle-Stavanger service starts on May 24 the new municipal airport at Sola will be the Norwegian terminus. This combined photograph and drawing gives a good idea of its shape and shows how it may be used as a base either for landplanes or seaplanes. An article describing the airport appears on p. 397.

THE WEEK AT CROYDON

Rarities : Meritorious Modesty : Meteorology : Paying Twice : Bunkers

QUITE a number of Imperial Airways' wireless operators, all well known at Croydon, left the I.A.L. European Division last week for overseas, in readiness for the "All Mail by Air" scheme. Others are expected to leave within the next few days, so it appears that all salary questions are satisfactorily settled.

There is a definite shortage of W/O's outside the big firms, and charter people have described these indispensable functionaries as being not only as rare as diamonds but just as expensive (which seems odd). The summer rush has shown up shortage of personnel in all branches, and it is accentuated this year by the Coronation. Charter firms all report more work than they can handle during the Coronation period, and there will be, it seems, a newspaper race to the North with special editions and photographs on the actual day of the ceremony. Free-lance pilots and even, it is said, some private owners have been pressed into this service. A loyal wish for fine weather on that day may be extended to cover the period when all sorts and conditions of men and machines will be racing Northwards with the news.

The Japanese airmen left last Thursday for Brussels and later went on to Berlin, where they signed Berlin's "Golden Book" in the City Hall. Brussels, which is 200 miles or so from Croydon, was reached by them in 49 minutes, which is averaging around 245 m.p.h. Everyone here at Croydon is very favourably impressed by the Japanese fliers, who are so cheery and unassuming. They really seem to think the *Divine Wind*, assisted by the High Gods, deserves all the credit. Some of our long-distance fliers should take a few lessons from these two quiet Japanese gentlemen on how to behave after a meritorious achievement.

On Sunday a new service, London-Frankfort, was opened. The line is pooled between Sabena and D.L.H. Mr. Robert Brenard, Imperial Airways' Press Bureau chief, took a party of London journalists on the inaugural flight. Imperials, of course, are the British chief agents for both D.L.H. and Sabena. Mr. Brenard appears to be extremely popular as a guide, philosopher and friend on these occasions. I'm told that as soon as the Press hear he's leading a party there's a danger of Fleet Street being entirely depopulated. About Sabena, I understand that a new and attractive London office has recently been opened by Mr. Henry Jonckeere, who has been at Croydon for the Belgian company for a long time. The office is adjacent to the Haymarket.

Imperial Airways' Coronation bookings on Empire routes are, it appears, extremely heavy, and on the Batavia route K.L.M. has booked, besides the Maharanee of Cooch-Behar, a number of Indian princes.

Regarding transatlantic services I hear that Air France recently took the sound step of engaging an experienced Atlantic sea captain as weather adviser. The idea is eminently sane and practical. We have special departments of the Met. Office studying these matters and a perpetual-

Commercial Aviation

motion Air Ministry official cruising to and fro across the Atlantic in the best-equipped liners acquiring weather wisdom and sun-bronze. Meteorological information about mid-Atlantic weather and winds is not excessive. As "Old Blinky," the Owl, in Masefield's *Midnight Folk*, aptly remarked:—

A very queer thing is the wind,
I don't know how it beginn'd,
And nobody knows where it goes,
It's wind, it beginn'd, and it blows.

British Airways report heavier traffic than ever before. There seems little likelihood that this company will return to Gatwick, though in the air transport business you cannot be in two places at once without paying twice for the privilege, and a machine which lands at Croydon, discharges load, and flies to Gatwick, presumably paying landing fees at both points, must be pretty heavily handicapped when other incidental expenses are reckoned. British Airways have been most unlucky over the wh business, and one sympathises with them profoundly.

Empire flying-boat captains fairly often come over a look at Croydon, either absent-mindedly making for th old home town or merely, when wireless tests necessitate flight somewhere, to annoy the landlubbers lurking do below. On Friday, for example, *Caledonia* circled Lond and Croydon in the course of one of her voyages. T Pegasus engines seem extraordinarily silent when the bo passes overhead.

A foreign pilot, conversing with British colleagues Croydon about matters of mutual aeronautical importan in Europe, ventured the opinion, after gazing over th expanse of bunkers and other hazards known as the Lond Terminal Airport, Croydon, that the only reason he co give for its comic contours was that the British were nation of golfers. Not only is this story true, but it do give us what we have needed for some time—an excus for the possession of such a place. A. VIATOR.

The Portuguese Agreement

AS already announced a contract between the Portuguese Government and the Imperial Airways-P.A.A. combine was signed on April 4 in connection with the southern Atlantic service route.

The combine is given the right to run airlines for the conveyance of passengers, mail and goods between Lisbon (the compulsory European terminal of the transatlantic air line) and the U.S.A. This right is to last for twenty-five years, and also allows for an air service between Portugal and Great Britain. On the Lisbon-U.S.A. run the Azores will be used as an intermediate stage. Time is allowed for the combine to carry out preparations, but a time has also been fixed for the start of operations. During the next fifteen years the Portuguese Government will not grant permission for any other American company to operate a service between the U.S.A. and Portugal.

The contract also provides for the formation of two Portuguese companies—the purpose of one being to construct machines and of the other to collaborate in the transatlantic service.

New British Airways Time-tables

THE first of British Airways' Electras made its maiden flight to Scandinavia last Saturday and the time-table has been correspondingly accelerated. Leaving Croydon at 9 a.m. the machine is scheduled to reach Stockholm at 5.35 p.m. (local time). The whole journey is now completed in 7 hours 20 minutes' flying time. During last year British Airways machines covered 347,130 miles on this route and carried 188,739 lb. of mails.

Three daily services to Paris are now being run, while during the Paris Exhibition, from June to September, the frequency will be increased to four.

Incidentally, those who know anything of the amount of work which has been going on in the background during the last few years will be glad to learn that Mr. F. W. Jones is in charge of British Airways' West African and South American planning department. This company, it will be remembered, have received the contract for this service, which will be run in due course.

Mr. "Farey" Jones was in charge of British Continental Airways' operations until the fusion of the two companies, and during that period he and his assistants had done a great deal towards bringing the South American project a little nearer to fruition.

Round the World

UNITED AIR LINES have settled on the fare for a round-the-world trip by air at $2,255 (£450). United's New York-San Francisco service is the U.S. connecting link between the transatlantic and trans-Pacific air routes, and the service will become effective on April 27.

Using the P.A.A. service from Alameda to Hongkong, a passenger will fly thence by Imperial Airways to Athens, where a change is made to A.L.S.A. At Rome A.L.I. is used for the run to Milan. K.L.M. from Milan to Frankfort, where the dirigible *Hindenburg* is boarded. The elapsed time for the April 27 service is 28 days, giving the traveller several days in cities along the line. Practically all of the flying from Honolulu to Frankfort is by daylight, the night flying being on United's service from the Atlantic to the Pacific, on Pan American's service from San Francisco to Honolulu, and on the *Hindenburg's* transatlantic crossing.

Three Stops in 2,600 Miles

ON May 1 United Air Lines will start their new 15½-hour transcontinental New York-San Francisco schedule. There will be only three stops in 2,600 miles, the Douglas D.C.3s to be used having a cruising range of 1,500 miles. Simultaneously with this speed-up, United will reduce its fares.

Leaving New York at 6.30 p.m., or Chicago shortly before midnight, passengers reach Los Angeles, San Francisco, Seattle or Vancouver, B.C., in the morning. On normal schedule passengers leave New York shortly before midnight and reach California in the afternoon—or, by leaving at 8.30 a.m., reach Los Angeles or San Francisco before midnight.

New Irish Schedule

THE new Dublin-London schedule was inaugurated last Monday by the Free State Minister for Industry and Commerce, Mr. Sean Lemass. Henceforward two services will be provided daily, and passengers from Ireland will have forty-six connections to the Continent from Croydon. The provision of an afternoon machine from Dublin will enable travellers from even the more remote parts of the Free State to reach the European capitals the same evening.

In the course of his remarks the Minister announced that the new civil airport at Collinstown, Co. Dublin, will be available for use in the autumn, and Mr. Sean O'hUadhaigh, chairman of Aer Lingus, Teoranta, stated that the total number of fare-paying passengers carried on all services from the date of inauguration (May 27, 1936) up to March 27 this year was 1,497. The percentage of scheduled trips carried out was 88.1 between Dublin and the Isle of Man; 98.9 between Dublin and Bristol; and 86.3 between Dublin and London.

Trans-Pacific History

ALTHOUGH the story of the film itself is a necessary mixture of dramatic fiction (suitably disclaimed in the preliminary title matter) and less exciting fact, *China Clipper*, which is now generally released, shows what can be, and has been done by American producers in the matter of "air-education" for the public. It will be a pity if we cannot go ahead and do even better with either our own Empire routes—which have a sufficiently "romantic" history in all conscience—or with the conquest of the Atlantic.

As a matter of interest, here are the facts of the Pacific experiment, which has now reached the stage of regular operation from San Francisco to Hong Kong. Serious work was started on base development as long ago as March, 1935, when the supply ship, *North Haven*, left for Midway, Wake and Guam Islands, and the first experimental flight was made from Alameda to Hawaii on April 16-17, 1935, with a Sikorsky S.43. 2,301 air miles were covered at an average speed of 136 m.p.h. On June 12 Midway Island was reached on a second survey flight, and early in August a landing was made at Wake Island. Guam, the last base before Manila, was reached in October, the flying time from Alameda being 45 hr. 47 min. for the 13,000 miles.

Commercial operations were started exactly a year later and the first service went right through to Hong Kong. Diplomatic and other arrangements were not, however, quite complete, and the regular services thereafter had their terminal at Manila.

NEWCASTLE—STAVANGER

Stavanger's New Airport for Landplanes and Seaplanes

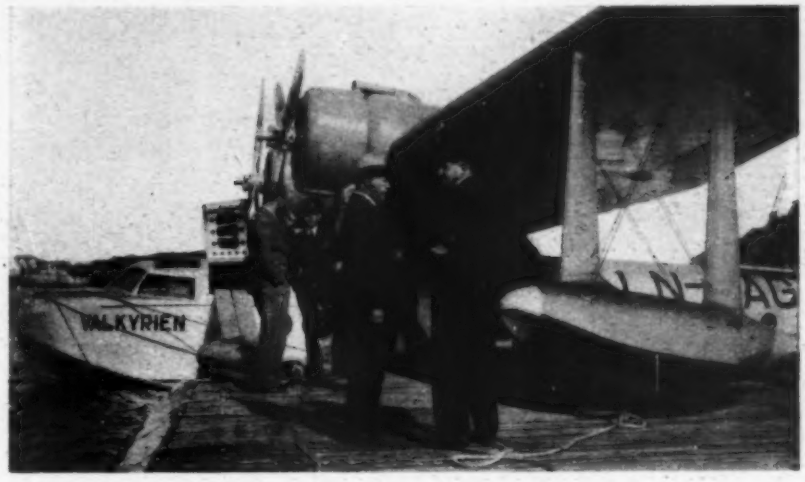
DUE to open on May 24, the service between Newcastle and Stavanger, Norway, will be of particular interest, if only because it may eventually be operated by both landplanes (from this side by Allied Airways) and flying boats (by D.N.L.). The comparisons will be extremely educative. The first crossing was made in 1914 by Mr. Tryggve Gran in a Bleriot, with an 80 h.p. Gnome, his time being 4 hr. and 10 min. Mr. Gandar Dower's concern has scheduled a run of a little over three hours. Later on D.N.L. will probably use a Sikorsky S.43 amphibian, which the company expects to use on their Oslo-Stockholm service.

Stavanger's municipal aerodrome at Sola will be officially opened on May 29, and on this and the following two days there will be an international meeting. King Haakon VII will probably be present. The aerodrome is situated on a great sandy area some seven miles from the town, and, if it should prove necessary, it will be possible to extend to an almost unlimited size. At present the maximum runs are 1,650 yds. in the N.-S. direction and 1,100 yds. in the E.-W. direction.

There is a connection by wide roadway between the aerodrome and Hafrsfjord, in Sola Bay, some 900 yds. to the north. There are two special runways to suit the prevailing winds, but elsewhere the ground is turf covered, so that light machines can be put down anywhere.

The aerodrome is well drained and can be used for traffic all the year around. Little fog is experienced, though snow may bring difficulties. Radio facilities are available.

The entire project cost some £67,500, of which the Government paid 60 per cent. and the municipality 40 per cent. Next year, incidentally, the work on Fornebo aerodrome at Oslo will be finished.



AMPHIBIOUS COLLABORATION: When D.N.L. eventually work on the Newcastle-Stavanger service it is probable that a Sikorsky S.43 will be used. This photograph shows the company's first machine of this type at Stavanger. In the foreground, with D.N.L.'s agent, is Mr. Bernt Balchen, the famous pilot.

Air Mail Changes

A NEW edition of the Air Mail Leaflet, giving particulars of the services available on and after April 18, has now been issued. Copies are obtainable at any post office. A number of changes have been made as a result of modified timetables

New C.A. Headquarters

THE Department of Civil Aviation will shortly be installed in new quarters at Ariel House in the Strand, and these will be formally opened by H.R.H. the Duke of Kent at midday on Friday, April 30.

This department has, of course, been located at Gwydyr House, Whitehall, for the past thirteen years and the transfer is necessitated partly by the forthcoming demolition of the rear part of Gwydyr House and partly by the extended responsibilities of the department.

New Equipment for Air France

SINCE every new machine for Air France must do 100 hours before being put on to passenger-carrying service the company is now "running-in" the Marcel Bloch 220 (16-18 seater) prototype which was handed over last week after completing its official tests. As machines are badly needed while the 40-seater Farmans are being tested, the "running-in" process began without any delay, and in four days the Bloch did four circuits covering Villacoublay, Toulouse, Marseilles and Villacoublay.

The cruising speed turned out to be 185 m.p.h. at 2,075 r.p.m., and the official test pilot gave the "220's" top speed as 220 m.p.h. at 7,350 ft. It is capable of maintaining flight with one engine stopped at 6,000 ft. fully loaded (20,000 lb.), and its range is 600 miles. Air France have placed an order for five more, all of which will be delivered before the end of May.

AUXILIARY PROPULSION

A CONTRIBUTORY factor to the performances attained by some of our latest military machines fitted with Rolls-Royce Merlin engines is the "ducted" radiator which produces a measure of thrust at high speeds. The principle on which these radiators function has been further developed by Messrs. C. J Stewart and F. W. Meredith, of the R.A.E., whose present scheme of supplementing airscrew thrust by that exerted by a mixture of air and exhaust gases pouring from slits in the trailing edge may prove highly beneficial to high-speed machines.

Briefly, the scheme converts into thrust the drag presented by the cooling system, which may be regarded as a form of heat engine increasing the speed of an aircraft. It entails the total enclosure of the engine, complete with exhaust manifolds, within a wing or the nose of a fuselage. A wing installation is arranged to admit air through apertures to two tubular radiators on each side of the airscrew shaft. The air is first compressed to pass over the radiating surfaces and subsequently over finned exhaust manifolds from which it derives heat. Exhaust gases may then be injected into the stream of air, adding to the momentum, and finally the air, with or without exhaust gases, is passed into special passages in which the pressure is reduced to its original value and expelled from the aircraft. Thus the thrust derived depends upon the rate of change of the momentum of the cooling air. The ejection orifices in the trailing edge are long, narrow slits with hinged flaps for adjustment.

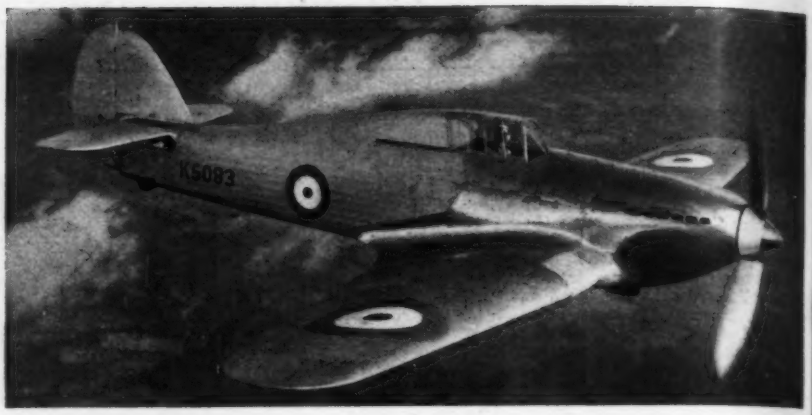
Speeds of the order of 300 m.p.h. are essential to obtain the propulsive effect and augmented speed, because the loss of energy of the stream in passing the cooling surfaces involves a loss of efficiency for lower speeds.

Should the system find practical application, British aircraft will benefit from an important "little something the others haven't got."

Problems of Co-operation Between Fighters and Searchlights

By

W. MacLANACHAN



LINKS in the AIR DEFENCE CHAIN

VERY pregnant reflections, and one very practical suggestion for improving the efficiency of the searchlight service, are contained in the following article. Mr. MacLanachan was a pilot in No. 40 Squadron during the War, at a time when that squadron was equipped with S.E.5.A. fighters. He was an intimate friend of the late Major Mannock, V.C., and had much to say about that great pilot in his excellent book "Fighter Pilot," which was published last year over his nom-de-plume of "McScotch"

IT behoves a country which has no bellicose intentions and which is concerned only with defence to assure itself that every item in its defence organisation is of the best. Notoriously, the strength of a chain is the strength of its weakest link, and in the Fighter Command of the Royal Air Force no weak links can be afforded. Operationally that Command includes the anti-aircraft searchlight battalions and artillery brigades of the Territorial Army, and for night defence the fighters are entirely dependent on the efficiency of the searchlights.

If it be assumed that the strength of the Royal Air Force fighter defence is up to establishment, and that the establishment figures for the anti-aircraft batteries and searchlight battalions have been chosen on some practical basis, the fact that the batteries have less than 50 per cent. and the searchlights less than 30 per cent. of their establishments makes our defence system lop-sided. Without entering into a controversy on the rival merits of fighter machine and anti-aircraft guns, it is obvious that for some considerable time the fighter squadrons must bear more than their share of the defence responsibilities. In fact, as conditions are at present, almost the entire onus has to be placed on the R.A.F. This is not the fault of the Territorial Army, but is due to the serious delay in deciding to increase Territorial equipment and accommodation to meet rearmament requirements and the reluctance of men to join the searchlight battalions of the A.A. The guns are the 3in. 1918 type, and have a maximum height range of 17,000-18,000ft. New guns of much better performance are on order.

The Fighters' Chances

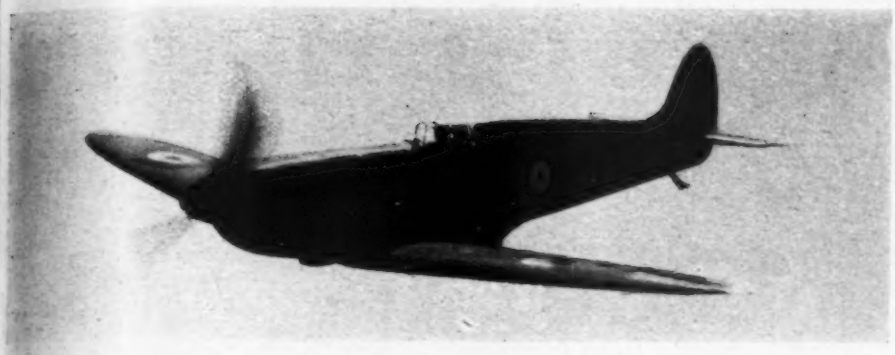
It is, therefore, necessary to ascertain how efficiently the Air Force can carry out its responsibilities by considering the conditions in which the fighter squadrons will have to work.

During the day, provided we have sufficient fighters and the period of warning is long enough, it should be an easy matter for capable and courageous fighter squadrons to intercept bombers. At heights from which random bombing of civilian populations can be expected visibility is particularly good, and, with wireless and other directions from ground observers, the defenders should have little trouble in finding the invaders on their approach or, at least, when they are returning.

At night, even in full moonlight, against well camouflaged bombers the fighters are impotent without the close co-operation of searchlights.

During the last war the Germans did not attempt a daylight raid on London after August 22, 1917, on which they lost three out of eleven machines—too large a percentage for any routine job. Afterwards they carried out twenty-one raids *at night*, until, on May 19-20, 1918, out of thirty-four machines which crossed the coast they lost seven, again a very large proportion.

War economics in personnel and material have not altered. Neither has the psychology of people who make war. No matter how repugnant the bombing of defence



"During the day, provided we have sufficient fighters, and the period of warning is long enough, it should be an easy matter for capable and courageous fighter squadrons to intercept bombers." The two modern fighters illustrated here are the Hawker Hurricane (left) and the Supermarine Spitfire.

less civilians may appear to British minds during peace-time, events in the last war, in Abyssinia and Spain, have demonstrated that neither commanding officers nor pilots have any serious scruples about giving the orders or executing them. It can therefore be taken for granted that bombing of large towns will be undertaken until it is proved to be uneconomical.

A Suggestion

The additional security offered by large formations of heavily armed bombers for day work can, to a great extent, be nullified by large formations of fighter aircraft and good visibility. At night, although the bombers can fly singly, or in widely extended series, the fighters are handicapped unless sufficient illumination is provided to allow effective attacks by several of the latter on one bomber at a time.

In any case, the greater the number of searchlights, the greater will be the potentialities of the defence pilots against bombers which remain handicapped by their original night flying conditions of open alignment.

This makes it all the more obvious that the searchlight battalions must be maintained at a strength commensurate with that of Air Force defence. It also appears absurd that a costly first-line defence unit, such as the fighter command, should be so entirely dependent on the strength of an organisation over which it has no control either in the way of equipment, personnel, or recruitment.

In view of this and the state of emergency which undoubtedly exists, there is one plan which I think worthy of serious consideration—that the Air Force assume complete control of all the searchlights, maintaining them on a Territorial basis as Auxiliary Air Force, while, until the latter is brought up to establishment, any surplus of recruits waiting to begin technical courses in the Royal Air Force can be trained as searchlight operators. The extra numbers accepted in the R.A.F. to meet the deficiencies of the Auxiliary Air Force searchlights could be decreased as the strength of the latter increased, until the searchlight section became entirely Territorial. Alternatively, eligible applicants for the R.A.F. in excess of the immediate requirements, whose services were likely to be required within a reasonable period, could be encouraged to volunteer for the searchlight section of the Auxiliary Air Force and thus obtain preference for the Regular Air Force. This, of course, would only be effective where searchlight training facilities were available.

The overwhelming success of R.A.F. recruiting in comparison with the failure of that of the War Office should make this proposal an attractive one, but, in addition to enquiring how the enthusiasm shown for one Service can be exploited to fill the gap in our defences caused by the deficiencies of another, it is advisable to ascertain the permanent value of any emergency measures that may be entertained.

Laying Down Principles

If some such scheme were put into operation the entire responsibility for its own particular part in the defence would rest on the Air Ministry. A possible objection may again be raised on the principle of "divided responsibility." It can be pleaded that the anti-aircraft batteries would then be dependent on the Air Force for the necessary illumination at night, but no one can deny that, however effective the new guns may be, the major responsibilities in active defence will rest on the Air Force, which, if not now, must ultimately accept the entire responsibility for air defence, including anti-aircraft guns.

This touches a subject on which the Government itself will have to make practical decisions—as to what the respective responsibilities of the Services are to be. It does not lie within the province of the Services or the departments to detail their own duties, and, as affairs are at present, extensive and harmful bickering amongst the spokesmen for the different Services is militating against the attainment of the unity so essential to well-organised defences.

The Government can obviate this objection by defining what are to be the obligations of the different Services and their departments in such a way that the staffs can make demands for what they consider indispensable to the efficient execution of their duties. The searchlight question is but part of a general problem, but, because of its urgency, can be made the primary case on which the broad principles are decided.

This is a matter of the greatest importance not only to the Minister for Co-ordination of Defence and the Cabinet, but also to Parliament and the electors who have acquiesced in the spending of such considerable sums for the defence of the country.

"... the greater the number of searchlights, the greater will be the potentialities of the defence pilots against bombers ..."

Topics of the Day

New Experience

AFTER a lapse of a couple of years, during which I had forgotten the very few things already discovered about the business, I had a chance last week of taking my first really serious lesson in Autogiro flying. Virtually, any impressions gained were those which would be obtained by any newcomer. My previous experience had been confined, in any case, to two half-hearted half-hours with the C.19 model (in 1930) and the C.30 model (in 1935).

Since the capacity of the Autogiro to vary its approach angle between level motoring and almost vertical descent (and its speed between 100 odd and next to nothing) is already perfectly well known, these features did not take me by surprise. Despite experience with one or two heavily flapped monoplanes, whose designers have bitten off a very little of the Autogiro characteristics, it is, however, just a little shocking to fly up to the aerodrome boundary at 1,000ft. and still find that one can undershoot if the vertical business is overdone.

Logical Control

TWO points which really excited me have not previously, I think, been given their due.

One is the extremely logical action of "spilling" one's lift immediately after landing. Only in the case of the direct-control Autogiro, or of similar devices, is it possible to do this, and only when such an action can be made is the really slow-speed landing a practical possibility. The "three-pointer," in which a fixed-wing type touches down at an angle of maximum attack, leaves such a flying machine in its most dangerous position, whether actually on the ground or not. It is susceptible to every gust blowing at a higher speed than that of the machine's stall.

The only alternative to variable incidence is the three-wheeled undercarriage—whether the third wheel is under the nose or, as in the case of the Cowey-Eugster device, behind the main undercarriage, which itself is placed well forward. With such an undercarriage one can land either fully stalled or not, according to conditions and preference. In a strong wind the pilot would fly the machine on to the ground and hold the stick forward of centre at least until way had been lost. To vary incidence by tipping the entire machine in a longitudinal plane has always struck me as being a rather clumsy method of doing things.

The second point concerned the detail control arrangements. Within reasonable limits the process of flying the Autogiro is a mechanical one. The pilot simply has to remember what to do, just as he has when driving a car.

A sequence of movements must be followed during the take-off, and this sequence is no more difficult than that used in the process of controlling a car from stop (engine off, hand-brake on) to go (top gear and cruising speed). In the air there are only three controls to worry about—the universal stick, the throttle and the fore-and-aft trimming gear. On the ground the machine is steered with the feet and the speed is regulated with the throttle, while the main control is locked—and it is not possible to move the quick-release lever for the brakes and rotor drive until this control has been unlocked.

Air Sense

FINALLY, there is the approach and landing. Easy enough for a pilot, but the necessary judgment can never be acquired by the book, whether the aircraft is of the fixed-wing, rotating-wing or lighter-than-air type. A combined sense of relative forward speed, sinking speed and height above the ground can only be obtained by experience. Easy though it may be to make an Autogiro approach this experience is still necessary, and the sales of any "machine for the million" will depend on the aptitude and patience of the "million."

In all respects the human race starts at zero in the matter of air sense. Nowhere in our family tree, as far as we know, is there any flying animal, and it is a matter for congratulation that our sense-stupid, feeble and clumsy breed has managed to do as well as it has. Luckily, our brains are not too bad, outrivalling those of the white ant and the rat (with similar tribal propensities—*esprit de corps* with us, blind instinct with them!), and we can overcome our muscular and sensular deficiencies.

Furthermore, we learn quickly and change—sometimes for the better—with astonishing suddenness. Progress appears to be carried on in waves, with Dark and Golden Ages, but each wave is a little more golden than the last. Individually, we are really quite civilised even now, though, when marshalled in battalions and suitably "propaganded," we appear to go forward to the slaughter in a manner entirely similar to that of the selfsame ants and rats—the only other creatures, I believe, to make extensive war on their own kind.

It is significant that the present best-sellers in the way of books and films deal largely with social injustices and with the more serious difficulties of the human race—and it is equally significant that nearly all the really enlightened films should come from America, where "every man for himself" had been the motto until the arrival of the slump.

None of which has anything much to do with flying—except, perhaps, that our brave new world (if any) may yet, as Mr. Wells suggests, be run by flying men and women. Such people certainly have a better chance than anyone of seeing the world and its peoples as a whole, rather than in the form of scare headlines, slums and slag heaps. Pilots are the most internationally minded people in the world at present, and they require, for their very existence, the solid prosperity which can only be the result of real co-operation. Sermon over. INDICATOR.

Private Flying

FROM the CLUBS and SCHOOLS

REDHILL

TIME for the week ended April 16 amounted to 50 hr. 45 min. Mr. Blackaller has passed his "A" licence tests, and the Puss Moth and Fox Moth were flown to Ostend and Amsterdam.

LONDON

The flying time for last week totalled 109 hr. 10 min. Mr. A. H. Curtis has completed the tests for his "A" licence and Mr. F. Gonsalves made a "B" licence night flight from Croydon to Lympne. New members are Messrs. F. D. Gamble and H. S. Broom.

SOUTH COAST

In spite of bad weather over 30 hours' flying was logged during the week. Miss Y. Barrenger and Messrs. R. H. Foord, W. A. N. Heygate and J. M. D. Legge have become members. The Percival Vega Gull will be demonstrated next Sunday.

PORTSMOUTH

The total flying time during the week ended April 16 amounted to 39 hr. 50 min. Mr. J. F. Carroll has obtained his "B" licence, and new members are the Earl of Ronaldshay, Flt. Lt. H. P. S. Burwood, and Mr. J. F. Howman. Mr. U. Williams demonstrated a Kronfeld Drone and Ground Trainer, many members taking advantage of the opportunity to try out these machines.

MIDLAND

For the fortnight ended April 15 flying times totalled 21 hr. 20 min. dual and 51 hr. solo. Cross-country flights were carried out to Braunstone, Meir, Broxbourne, Woodley, Bekesbourne, Tollerton and Croydon. Mr. S. Lunt has passed his "A" licence tests, and new members are Messrs. H. B. Hillcoat, C. Lambert, and C. F. P. Powley (flying), and Mr. L. W. Whitworth (ordinary).

NORFOLK AND NORWICH

During last week the Norfolk and Norwich Aero Club succeeded in logging no fewer than 74 flying hours. The latter end of the week saw the arrival of the American Taylor Cub. This machine spent three days at the airport, during which time it was demonstrated to, and flown by, a very large number of the Club's pilots. Visitors by air during the week included a Westland Wessex from Imperial Airways, a banner-towing machine from Air Publicity and many private owners.

HERTS AND ESSEX

With the return of bad weather hours dropped considerably and the total time was 114 hr. 16 min. Mr. A. E. Brian has gone solo, and Mr. G. C. Toye completed the remainder of the "B" licence tests, including the night flight to Lympne. New members are Miss P. A. Thompson and Messrs. G. R. Laub, M. R. Willows, S. A. Levenson, A. E. Brian, J. P. Smith, A. W. Searle and G. Tatham. The fleet and personnel of Capt. Rimmer's Coronation Air Displays were accommodated on the aerodrome for three days for the preparatory rehearsals. The Carnival dance in the clubhouse last Thursday was attended by ninety-seven members and friends.

YAPTON

Flying times for April to the 17th totalled 59 hours, the weather being variable. Miss Beryl Partridge has joined as a flying member and is taking the £15 "A" course. Mr. R. N. Hill has passed his "A" licence tests.

CAMBRIDGE

Marshalls' Flying School put in 30 hours' flying last week. No flying was possible on three days of the week owing to bad weather conditions. Messrs. Gibson and Lomas have joined the school and had their first instructional flights last Sunday. Cross-country flights were made to Hatfield, Heston and Abridge.

NORTHAMPTONSHIRE

Capt. F. P. Loftus and Messrs. A. Chattaway, R. Eyton-Williams and E. C. Booth have obtained their "A" licences during the month, and Miss Benson is now ready to take her tests. New flying members are Messrs. E. H. L. Cooper and A. E. Morrison-Bell. Future events include a visit by Coronation Air Displays on April 24, and on May 12 a Coronation dance will be held in the clubhouse.

HULL

The Hull Aero Club has purchased a new B.A. Swallow (G-AEVZ) and this has already become very popular. Flying last month totalled 41 hours, of which only five were instructional. Most of the time was put in after the arrival of the Swallow—which coincided with practically the only fine weather of the month. Mr. H. N. Camsell was, however, able to make his first solo flight. The Club is losing its honorary secretary, Mr. E. D. Gosschalk, but his place will be taken by Mr. Lamb.

HANWORTH

Members flew 66 hr. 30 min. during the week and cross-country flights were carried out to Sywell and Cambridge. New members are Mr. Hafner and Mr. Welsh and "A" licence tests have been passed by Mr. F. Reekie and Mr. D. A. Woolfe (National League of Airmen). Great week-end activity is taking place at Hanworth, where the R.A.F. Volunteer Reserve have recently commenced their training, and the Midland Bank Flying Club members are taking preliminary instruction in Club machines prior to starting their training proper.

BORDER

Miss Evans and Mr. D. Livingstone-Bussell have obtained their "A" licences. New members continue to come forward regularly, including quite a number from the outlying districts. Among these latter are Mr. and Mrs. Henderson, of Hawick, and Mrs. Diggle, of Penrith. New local members are Messrs. J. B. Pearson and T. A. M. Nash. The second Carlisle Dawn Patrol is expected to be held next Sunday. The draining of the aerodrome is rapidly being completed and it is hoped that the whole area will be available by the time these notes are in print. Flying times for 1937, despite the generally unfavourable weather, show an increase over the corresponding period for 1936.

BROOKLANDS

Flying time for the week was 90 hours, during which time Messrs. James and Auster went solo. Messrs. Metford and Harman have completed their "A" licence tests, and Mr. Colledge, brother of the famous skater, has started instruction. New members of the week were Messrs. Duke-Woodley, Williamson, Doble, Bray, Willoughby, Gough and Mr. and Mrs. Holden-Croad. Two ladies also joined, these being Miss Millar and Miss Stewart.

The first round of a cross-country competition was flown off last Sunday; each entry had to fly for seven minutes on a compass course given him as he went out to the machine. At the end of the time he had to pin-point his position and fly back to the aerodrome. Marks were also given for general flying, Mr. Robert Ashton being the passenger-judge. Another round will be flown off next Sunday.

ON TEST AT READING: Mr. Miles' latest slotted-flap idea, in which the two "Venetian blinds" appear to have a differential motion relative to one another. Tests of this high-lift device shows that they are far from being slatted flops.

C. A. S. C.

On Sunday last members flew 12 hr. 45 min. at Cambridge. Four flew to Leicester for Army Co-operation work, and six went across country to Abridge. Messrs. Gibson, Lomas and Eldrett have joined the Corps, and Messrs. Burton and Basson have transferred to the R.A.F. Reserve.

YORKSHIRE

Flying on Club aircraft totalled 30 hr. 10 min. during the week, including flights to and from Heston, Hatfield, Newmarket, Scarborough, Brough and Doncaster. A new member is Mr. G. W. L. Cox, and Mr. J. B. Breare has commenced flying training under the Aviation Group scheme.

CINQUE PORTS

With the flying season well under way again many familiar faces appeared at the Club. Mr. Garcia, who took his "A" licence with the Club last year, has returned to buy a Moth and to put in as much practice as possible this summer before returning to South America. During the week a formation of three Club aircraft visited Coventry, where the pilots and passengers were entertained by the Daimler Company. Mr. Brand completed his "B" licence night flight and has now almost finished his tests. Visitors during the week included Mr. and Mrs. Forsyth in a Miles Hawk VI and Miles Whitney Straight on their way home from a holiday in Capri, while Mr. J. P. Wakefield returned after five months in Germany, Switzerland and Italy.

WINTER in the ARCTIC

Some of the Difficulties Which Have Been Overcome by Canadian Charter Pilots : Specialised Technique

By GUY H. BLANCHET

TEN years ago practically no winter flying was being carried out in Northern Canada, and the aeroplane had not ventured into the Far North beyond the woodlands, where the barren grounds stretch to the sea coasts of Hudson Bay and the Arctic. To-day it is being done as a matter of course. During this interval a great deal of pioneering work has been carried out.

Flying in the northern summer offers few serious difficulties. The sea and innumerable lakes provide landing places almost everywhere—and water is water the world over. It is when the water changes to ice and snow covers the land that new factors are introduced. The end of summer is marked, not so much by cold or storm, but by low clouds. These clouds blanket the land and make the autumn a long, dreary season during which snow slowly accumulates and frost and wind battle for possession of the waters. Again and again ice forms, only to be broken up by the next wind. The floes are driven about, piled together and finally re-cemented during the next calm. This goes on during much of October, and, on the sea, well into November. The resulting ice is made up of smooth patches among jumbled fields of fragments. But the ice is not stable even when it is securely set; under the heavy pressure of wind and tide the ice "rafts," or buckles, and piles up in ridges.

Hobson's Choice

A pilot has an unhappy choice at this season. Young ice is smooth but probably not strong, while the old ice is strong but too rough to use. His best choices are small lakes, sheltered bays, or channels among islands. Situations arise when one *must* land and there is but a choice of evils. We met this once on arriving at the Arctic coast about the end of October. We had found the inland lakes quite safe, but when we reached the sea saw that the ice there was obviously bad. There were no suitable lakes among the mountains that fringe the coast so we cruised about looking for sheltered water.

We found a clear spot among islands, smooth in the middle and rough near the shore, and examined it carefully. It looked safe and we decided to risk it, landing on the clear and heading toward the stronger but rougher ice. When we touched, the ice bent ominously but held as we raced across it; a second machine followed safely; but a third hesitated and was lost. It is bad to break through at high speed, but in such conditions safety lies in speed.

Even when exercising the greatest care accidents happen. On one occasion a ski was broken without our knowledge in taking off. A fair landing could have been made on one ski if we had known about it, but we dropped down quite unconcernedly to a lake at the base. Anything might have happened, but the machine dropped on to the axle of the damaged ski, pivoted on it, then stood on her nose. Thereafter we took to examining the skis in the air.

On another occasion we were not so fortunate. We were taking off in poor light under low, misty clouds. Without shadows, the snow takes a dull, uniform greyness in which drifts and irregularities are lost. When just about at take-off speed, we bumped heavily over a hard drift and the machine dropped on to the port wing. We spent a bad fortnight before relief arrived, and that machine now rests on the bottom of the lake. This accident revealed a weakness in design that was later corrected, but it also drove home the necessity of examining a runway over shadowless snow wherever possible. It was noted that the snow is always hard after winter settles in and that the drifts lie in the direction of the prevailing north-westers.

Bad as the ice is, it is better than the land. Boulders are scattered over it as though sprinkled from a giant pepper-pot and the snow partly covers them. They may be anywhere on the apparently smooth, snow-covered plain, and it is best to avoid the land, except in emergency or when conditions are known or recognisable as safe. In landing on ice or land in clear weather, at least, the pilot can exercise choice and make use of his experience and judgment. But the Arctic produces a situation in which neither skill nor experience is of much assistance, and if the pilot is wise he will land wherever he may be and before the situation develops.

Gale Effect

Such a situation is faced when a rising wind starts the snow drifting. The snow is dry and packed, but not crusted. A fresh wind cuts the fine particles from the surface and sends them scurrying in little filmy streams. These grow to a rushing tide which lifts from the ground as the wind increases. Finally, with a gale, the air for a hundred feet or more is filled with a whirling chaos of driving snow. The upper air may be clear but the ground is lost, land, lake and hill, in an intangible white cloud. Even the Eskimo recognises the danger of the wind-drift and avoids it by building an igloo and letting the storm sweep over him.

In the early days of Arctic flying the pilots did not realise its seriousness and they sometimes tried to fight through it to the shelter of their bases. Soon the time for a safe landing had passed and, when landmarks were lost in the drift, navigation became hopeless. Sooner or later a landing had to be made, dropping blindly through the "blackness" of the snow to what chanced to be below . . . In two such landings, luck was with us. In one case we bumped heavily enough but came to rest undamaged on a moderate-sized lake enclosed by hills.

Trial and Error

In the other we were flying over rough sea-ice with open water in sight. Suddenly, with little warning, a wind sprang up. Mist was blown in from the open sea, snow commenced to fall and the ground drift started. An immediate landing had to be made. We came down on smooth ice. Two days later, when the storm eased, we found ourselves on a comparatively small smooth field, with barricades of rafted ice all about. Not far away the ice was adrift! The same pilot, a few years later, lost his life in a simple landing when a ski caught an upturned ice-cake.

And so, by the painful process of trial and error, pilots flying in the Far North learned the technique of winter flying; the dangers and how to avoid them, and the possibilities and limitations of the aeroplane itself. The work of the northern pilot has received little recognition. Of a group of seven engaged on a northern venture a few years ago only two remain alive. Their work has resulted in the acceptance of the aeroplane as an aid to the general development of Northern Canada.

WHY NOT SEAPLANES?

Floats, whether as Standard or Alternative Equipment, are Becoming More and More Popular with the American Private Owner

By ROBERT C. CODMAN

Two American private-owner types equipped with Edo floats. On the left is the latest Stinson Reliant, and above is a Waco — the latter with the amphibious type.

IT is several years since Dr. Edwin U. Light, of New Haven, Conn., fitted his Bellanca with floats, crossed the Atlantic in easy hops, and flew across Europe, the Mediterranean, Asia Minor, India and Siam to Canton. There his machine was freighted to Seattle, whence he flew down the west coast of the United States to Mexico, Central America, Cuba and back to New York. This flight, however, gave everybody some idea of the usefulness of the seaplane and suggested that an amphibian would be even more useful.

Last year a mass seaplane cruise was sponsored by Rudolph Loening and George Post, of the Edo Manufacturing Co., with Gibson Island, in Chesapeake Bay, as a base. Eleven seaplanes and three amphibians took part. This event is expected to be an annual affair.

Every year a greater number of American owners resort to floats as a means of solving their flying problems. In New York City it is possible to land at the Battery, where a seaplane ramp has been constructed. On the ramp there is a turntable so that the machine taxies up to the turntable, discharges its passengers, is turned and taxies off again. At the Boston Municipal Airport, also, there is a ramp. When a pilot wishes to put his machine up for the night a large wheeled platform is let down the ramp so that the machine can taxi on to it. The floats are then lashed to the platform and the machine propelled to the hangars. It is not an unusual sight to see eight or ten seaplanes lying half a mile away from the ramp.

Seaplanes and amphibians have come to be very popular with the sportsmen who wish to reach more inaccessible inland waters on fishing trips. Parties are flown to such places with all equipment for the duration of the trip, and at a prearranged time the machine makes another trip and brings the party back again. Much the same procedure is in use in Canada amongst mining prospectors.

Perhaps the foremost advocate of the seaplane is Col. Charles A. Lindbergh. On his trip to China via Canada and Alaska he used a Lockheed Sirius seaplane, and this same machine was used on his flight to Greenland, thence to Europe, Africa and South America.

While floats are now the most reliable type of landing gear, the cost of an amphibian has been so great that only the wealthier pilot could consider such equipment. Numerous concerns have undertaken to build a small amphibian, but the problems have been such that until recently there seemed to be no hope for the type. The Fleetwings Sea Bird, which is constructed entirely of stainless steel, seems to have conquered the salt-water corrosion difficulty, and suggests the possibility that there might be such a thing as a moderately priced amphibian with the ability to endure salt-water work.

Recently the Edo people have developed an amphibian float gear. (This was illustrated in *Flight* of March 4, and reminded us of the Short gear produced many years ago; this did not take on here.—ED.) Such a device, apart from its obvious value, saves an owner quite a bit of expense, as the customary charge for handling a machine out of the water and into the hangar is about five dollars.

Commercial Value

It is not only the private owner who makes use of seaplanes. A number of short transport lines along the coast depend entirely upon float equipment to operate their lines. A lobster concern, with its main office in Boston, Mass., used float-equipped machines to keep track of their business at a number of fisheries stretching as far north as Newfoundland. Spare engine parts are even flown to trawlers at sea. Several types of large military machines recently delivered from the United States to Columbia were mounted on floats to make the trip.

It is a notorious fact that airports occupy so much ground that they are frequently located many miles from the pilot's or passengers' destination. In many instances it is possible to land at a place miles nearer one's destination with a machine equipped for the water. The most outstanding example in the U.S. is the City of New York. A landplane must put down on Long Island or in New Jersey in order to discharge passengers for New York. The previously described ramp at the Battery makes it possible to land on Manhattan Island.

The realisation that the seaplane can increase operating efficiency has led many private owners to get acquainted with seaplane flying, and each year sees more machines converted into seaplanes for the summer season. With the advent of the v.p. or c.s. airscrew, the problem of taking off from smooth water or from small areas has been largely solved, and any owner should get much more out of his machine if floats are included in his equipment.

THE INDUSTRY

Autogiro H.Q. at Hanworth : Fuel and Oil Developments : A Manufacturer's Views on the Steel Shortage

Autogiros Under One Roof

HAVING erected office premises at the end of their Hanworth hangars, the Cierva Autogiro Co., Ltd., will transfer its headquarters there next Monday. The official address is the London Air Park, Feltham, Middlesex.

A small reception office will be retained at Bush House, London, but all correspondence should be addressed to the new premises.

Alvis Architecture

ALL who studied *Flight's* recent article on the layout of the Alvis test shops will have realised that the architectural problems involved can have been no ordinary ones. We learn that the architect was Mr. W. G. Phillips, P.A.S.I., who worked in collaboration with the N.P.L. and Capt. G. T. Smith-Clarke, director and chief engineer of the Alvis Company. Mr. Phillips was also architect for the new Alvis test installation at Baginton and for the new Daimler "shadow" factory and extensions.

Alcoholic B.H.P.

A GREAT many motorists—the more sporting, no doubt, initially intrigued by the romantic associations of the name "Discol"—are familiar with the good qualities of Cleveland Discol.

Following fifteen months of investigation the Cleveland Petroleum Products Co. (Upper Woburn Place, London, W.C.1) are now marketing this alcohol-blended fuel for aviation purposes. Type tests, it is stated, show a high power output, low consumption, slowing-down of carbon formation, and—an interesting point—complete freedom from the danger of carburettor-icing.

Aviation Trust Results

F.T.M., Ltd., managers of the Aviation and Universal Investment Trust, announce that the second distribution to unit-holders in respect of the period ended April 16, 1937, will be at the rate of 3.345323d. per unit gross. This represents a return to the original unit-holders at the rate of £5 9s. per cent. for the half-year.

Aviation and Universal Investment Trust spreads its investments over a very wide field of British industry, including concerns as widely differing as the Bristol Aeroplane Co., Ltd., and the London Brick Co., Ltd. The directors of the management company include Lord Sempill, chairman, Sir Herbert Morgan, Sir Alfred Beit, M.P., Mr. G. A. Moncrieff and Mr. T. Law.

The Steel Problem

ADDRESSING the annual general meeting of British Timken, Ltd., at Birmingham last week, Mr. Michael Dewar (chairman and managing director) spoke strongly on the subject of the cost and shortage of steel.

He said that for forgings for large bearings they had recently been quoted exactly double the price paid only eighteen months ago. Everyone was scrambling for steel and other raw materials and probably ordering far more than they really needed with the object of making certain of some stocks. Everyone was also scrambling for skilled men. The supply of men in the engineering industries was limited, and if they were transferred to the manufacture of armaments they could not be making other products as well.

"It appears that there is trouble ahead," said Mr. Dewar. "Some action should have been taken when the re-armament programme was announced. It is becoming daily more essential that something should be done if we are to achieve the rearmament programme without causing grievous harm to our economic situation.

"I would suggest two lines of action, one by the Government in taking off or reducing the duties on engineering products imported into this country and thus releasing men and plant for the rearmament programme, while at the same time stimulating international trade; the second by action through the big trade associations in this country for the voluntary restriction of the consumption of essential materials, such as steel, in projects which could be postponed until the situation becomes easier."

A New Aero Engine Oil

WELL known as a private owner (and, incidentally, as an unusually lucky participant in arrival competitions), Mr. R. E. L. Beere is now in charge of the aviation side of the Cities Service Oil Co., Ltd.

The company, which is a subsidiary of one of the largest petrol and oil concerns of America, is perhaps best known in this country for its "Koolmotor" alcohol fuels. In addition, "Citex" oils are marketed, and, after considerable experiment, a range of aircraft oils is being offered under this name.

Cutting oils are yet another product in which the company deals in large quantities, and manufacturers interested can obtain details from them at New Oxford House, Hart Street, London, W.C.1.

A Proud Record

"WE have not lost a client," is the claim of Essex Aero Ltd., of Gravesend Airport, who specialise in C. of A. airframe and engine overhauls, modifications, and general maintenance work. A recent paragraph may have given the impression that they are a newly formed concern, whereas actually they have been operating for an amply long length of time to make their slogan a really convincing one.

Aircraft Industries Corporation

IT is announced that W. A. Phillips and Partners, Ltd., have sold their entire interest in Aircraft Industries Corporation Ltd. Mr. W. A. Phillips has resigned his position as managing director, and his seat on the Board of Aircraft Industries Corporation Limited.

The registered office of Aircraft Industries Corporation has been transferred from 79, Lombard Street, London, to the office of Thomson McLintock and Co., at 71, Queen Street, E.C.4.

It is stated that there is now no connection whatsoever between Aircraft Industries Corporation, on the one hand, and Mr. W. A. Phillips and the firm of W. A. Phillips and Partners, Ltd., on the other hand.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

AIR CHARTERS LTD. Private company. Registered April 14. Capital £[illegible] in 100 shares of £1 each. Objects: to maintain and operate aircraft and motor vehicles of all kinds for hire, charter or taxi purposes, etc. The directors are Anthony Ord Humble-Smith, and Francis C. Fisher. Regd. Office: Bournemouth Airport, Christchurch, Hants.

AERO AND GENERAL ENGINEERING COMPANY LTD. Private company. Nominal capital £2,000 in £1 shares. Objects: To carry on business as manufacturers of and dealers in all types of brass, steel and other repetition and replacement parts, forgings, castings, etc. The permanent directors are Roland A. Webb and Albert Barker (both directors of Aerodyne Radio Ltd.). Registered office: 10, Coleman Street, London, E.C.2.

INCREASES OF CAPITAL

WESTLAND AIRCRAFT LTD. (302,632). Westland Aircraft Works, Yeovil, Somerset.—The nominal capital has been increased by the addition of £[illegible] beyond the registered capital of £250,000. The additional capital is divided into 2,000,000 ordinary shares of 5/- each.

CHANGE OF NAME

PALESTINE AIRWAYS LTD., 2, Grosvenor Gardens, London, S.W.1.—Name changed to Palestine Air Transport Ltd., on March 20, 1937. The company was registered as a private one on December 18, 1934. The directors are the Rt. Hon. Leopold S. Amery (director of Southern Railway); Pinhas Rutenberg (managing director of Palestine Electric Corporation Ltd.); Lt. Col. Harold Burchall (asst. general manager of Imperial Airways Ltd.), Major Harry L. Nathan and Percy G. Ross-Hume (managing director of British Trusts Association Ltd.).

PUBLICATIONS RECEIVED

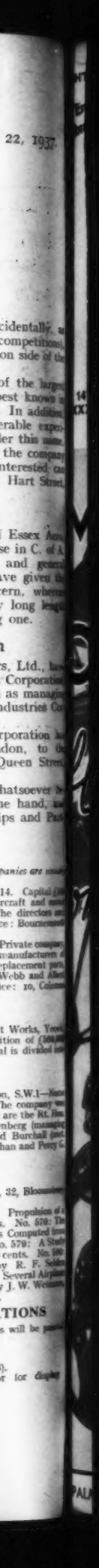
Flying Years, by C. H. Keith, price 18s. John Hamilton Ltd., 32, Bloomsbury Street, London, W.C.1.

National Advisory Committee for Aeronautics: Report No. 567: Propulsion of a Flapping and Oscillating Airfoil, by I. E. Garrick, price 10 cents. No. 578: The Effect of Lateral Controls in Producing Motion of an Airplane as Computed from Wind-Tunnel Data, by F. E. Weick and R. T. Jones, 10 cents. No. 579: A Study of the Two-Control Operation of an Airplane, by R. T. Jones, 10 cents. No. 580: Heat Transfer to Fuel Sprays Injected into Heated Gases, by R. F. Selden and R. C. Spencer, 10 cents. No. 583: The Rolling Friction of Several Airplane Wheels and Tyres and the Effect of Rolling Friction on Take-off, by J. W. Weinman, 10 cents. Superintendent of Documents, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

(The number in brackets are those under which the Specifications will be published and abridged, etc.)

(*Published April* 22, 1937).

26125. DE PARAVICINI, T. P.: Oil coolers for aircraft (463,303).

26358. RANGABE, A. R.: Apparatus for signalling from or for display purposes on aircraft (463,196).